



Blended approach to learning and practising English grammar with technical and foreign language university students: comparative study

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Abstract

Blended design of teaching/learning foreign languages, in this case English grammar, has become widely spread within the higher education. The main objective of the article is to discover whether blended approach enhances the process of acquiring new knowledge in the field. The research was conducted at two institutions: faculty of informatics and management, University of Hradec Kralove (technical students) and faculty of education, University of Jan Evangelista Purkyně, Usti nad Labem (foreign language students), Czech Republic. Totally, the research sample included 123 bachelor students. Data were collected in three phases: (1) face-to-face pre-testing to monitor entrance knowledge before the process of blended learning starts, (2) post-testing 1 applied after the blended learning approach and (3) final face-to-face post-testing 2 administered at the end of semester. Phase 1 was followed by autonomous learning from the online course; teacher's feedback was provided to the students after phase 2 so that they could correct their mistakes, and improve the knowledge in phase 3. Eight hypotheses were tested to discover whether there exist statistically significant differences in test scores between the technical and foreign language students. The results differ according to the students' level of English knowledge. However, they entitle the described blended learning approach to be applied for acquiring English grammar for B2 and C1 levels of CEFR.

Keywords Blended learning · Higher education · English grammar · ESP · English for specific purposes

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Introduction

In the time of ICT implemented in all human activities, blended learning is appreciated by most students as it combines the best characteristics of online learning and face-to-face teaching with the aim to enhance the process of instruction (Simonova 2018).

The blended approach provides more flexibility for students and teachers because the use of technologies makes more space for direct, face-to-face communication. It facilitates specific kinds of learning activities that might not be possible without the technology, as presented e.g. by the SAMR (Substitution—Augmentation—Modification—Redefinition) model (Netolicka and Simonova 2017), students activate different abilities and skills to build new knowledge, and consequently, they demonstrate what they learned. Last but not least, both teachers and students have the opportunity to develop their skills in using latest devices and applications. Considering a wide range of delivery methods, blended learning is widely appreciated for the possibility to study using individually preferred learning style and pace. The experience in blended learning proved that well-designed blended courses not only enhance students' learning towards acquiring new knowledge but also increase the retention of knowledge, even in large classes (Amaral and Shank (2010).

Additionally to these facts, Mansouri (2018) remarks that in language learning theory, the term 'acquired' refers to the state which substantially differs from one student/person to another, as it depends (instead of others) on the level of education the student reached. Moreover, to 'internalize' the system of the language, including grammar, takes much more time, if reached at all. In foreign language situations, the student is usually exposed to the foreign language for a very limited time—during the lessons, semesters, academic year(s), and Mansouri considers grammar to be "... the backbone of language and without it, the produced text, whether it is spoken or written, will be classified with many labels: broken, uneducated, incomprehensible or simply not belonging to the English language. This is a very disturbing phenomenon which we can see nowadays very widespread everywhere in the world; particularly on the Internet. It is distorting the English language as an international tool of communication "(Mansouri 2018, pages not numbered).

In the academic context, where mostly English for specific purposes is used, grammar is expected to play an important role within all language skills.

In relation to the ICT implemented in the process of instruction, the question appears whether, or not, the blended approach should be applied to help learners acquire the learning contents with less effort, in shorter time-period, in a more natural way, i.e. to make the process of instruction more efficient. To answer this question, the learning objective and outcomes should be defined, in other words, what the teacher is going to teach and what the learners are expected to acquire. Then, methods (scenario) towards reaching objectives should be designed, including the tools for measuring learning outcomes. Finally, having all these criteria in mind, learners' effort, time spent on learning and the appropriateness of blended

learning should be considered, and the decision made whether/to what extent the blended learning will be applied. Of course, both the learners' competency in using technologies for educational purposes and ability to work independently, been supported by electronic guidelines and teacher's immediate feedback, provide strong impact on the learning process.

Reflecting the above mentioned, the main objective of this article is to (1) introduce the model of blended learning for acquiring English grammar within English for Specific Purposes (ESP) by the students of the Faculty of Informatics and Management (FIM) and Faculty of Education (FE), and (2) discover its impact on students' learning results.

Theoretical background

The lifelong learning, both the formal and informal, has currently become a key aspect and its importance is expected to be even increasing. Within this concept, the focus on the process, particularly on methods of learning and teaching, is highly topical and cannot be considered without psychological context. This is the field of psychodidactics—an interdisciplinary theory connecting knowledge and approaches of general didactics, educational psychology, particularly psychology of learning, cognitive psychology, neural sciences, chemical mechanisms running in the memory and during learning, and other disciplines (Prucha et al. 2009). Currently, information and communication technologies have been playing an important role in conducting learning and teaching processes (Skoda and Doulik 2011).

The ability to remember and learn is one of the most important human cognitive abilities centered in the brain where neural cells form the network which creates the primary association structure. It is unique for each individual and determines cognitive and association processes, thus making impact (instead of others) on individual's memory and style of learning. As discovered by Comenius in the 17th century (Comenius 1947) and proved by numerous scientists later on (e.g. Riding and Read 1996), information coming to the brain has a higher chance to be remembered if

- it can be associated with anything known before,
- brought by several senses simultaneously,
- subjectively considered important,
- supported by pleasing feelings,
- emotionally supported (either in the positive, or negative way),
- discovered by the learners themselves.

For learning, the memory model based on remembered information and cognitive processes of its evaluation is crucial. The more frequently the information in association structure is recalled, the more it differs from the primary one, been adjusted to the newly developed knowledge and learner's experience (Gais and Born 2004). The quality features of memory can be improved by exploiting efficient learning strategies reflecting individual strengths of the learner and

arranging the information to be acquired in appropriate order, which closely relates to teacher didactic content knowledge (Doulik 2005).

Moreover, other factors provide impact on the process of learning, e.g.

- stressful environment, when lower levels (boredom, tiredness ect.) and extremely high levels of stress decrease learner's quality of remembering, whereas mild levels support this process (Shors 2004; Payne and Nadel 2004);
- learner's feelings of success and/or failure, which are crucial for motivation to learning; the strongest negative feelings arise from the individual's failure in front of the class (Elliot 1999; Hangen et al. 2018);
- personal goals, which work as the decisive power in motivation processes, when influencing their target, content and intensity, as stated e.g. by Boekaerts (2004);
- last but not least, the importance of quality sleep, which is widely recognized to be an important factor (Mitru et al. 2002). As Huber et al. (2004) state, each information in memory network is predisposed to interference; it is strengthened step-by-step, and the key consolidation comes when sleeping.

Efficient learning is expected to

- be connected to problem-solving and discovering something new; and this process should be accompanied by learner's joy, bring satisfaction, feelings of success, and praise and reward;
- enable gaining individual experiences and experience;
- be appropriate to individual abilities of the learner, not causing strong stress;
- be perceived by as many as possible senses simultaneously and
- create new associations within existing structures (Skoda and Doulik 2011).

All these factors are identical with characteristics of spontaneous intuitive learning with small children, when strongly rigid knowledge is saved in the long-term memory, thus forming child/learner's preconcept (naive theories). Regardless of long-time institutional education, the preconcepts may not be correct (misconceptions); however, they are considered valid by the learners until enough evidence is collected to change their understanding, i.e. in some cases even till the adult age. Therefore, *the didactic modification of preconcepts and misconceptions developed within learner's previous studies of English language is the main objective of the application of blended learning model in the instruction.*

From the theoretical view, the blended learning model implements:

1. The theory of learners' *preconcepts and misconceptions*, which is based on works by Vygotsky and Piaget, particularly on Vygotsky's *Мышление и речь* published in 1934 (Vygotsky 1986), and Piaget's *Psychology of intelligence* published in Piaget 1951. As discovered by Blown and Bryce (2006), learners' preconcepts are not stable, they are modified towards removing misconceptions. Three types of conceptual changes may appear:

- long-term evolutionary small steps, targeting at restructuring of preconcepts/ misconceptions within years;
 - mid-term steps, when the learner searches for alternative solution(s);
 - short-term dynamic form of conceptual crystallization, running in seconds, when a new incentive connects two isolated concepts thus forming a newly developed one with a new meaning and content (Craver 2003).
2. The theory of *constructivism*, stating that knowledge is not passively accepted but actively built in the process of cognition and learning, and human cognitive structure is flexible permanently considering new experience (Wheatley 1991). Defined by Piaget in the first half of the 20th century, other authors worked out this approach, e.g. G. Bachelard, J. D. Novak, A. Giordan, D. Larochelle, A. Garanderie, A. Bandura, M. Gredler, J. van der Brink etc. (Bertrand 1998). Constructivism explains that humans construct knowledge and meaning from their experience. Therefore, the theory can be directly applied to education. Undoubtedly, constructivism is primarily exploited in science and mathematical education; however, it also appears in the field of humanities—(foreign) languages and literature (Hawkins 1994). Constructivist models directing learning activities intentionally change learners' preconcepts and misconceptions. Learners' development is constructed as targeted modification of the real-state concept eliciting the cognitive conflict which is expected to finally result in accepting the newly formed concept (construct) and replace the misconception. This step is made after checking its validity by the learner (Skoda a Doulik 2011).
 3. *The Substitution—Augmentation—Modification—Redefinition (SAMR) model* (Netolicka and Simonova 2017), which assists teachers in didactic implementation of latest technologies/devices into teaching and learning. The SAMR model includes four successive phases (levels) which cover two areas (Enhancement, Transformation), each containing two steps (Substitution and Augmentation within Enhancement; Modification and Redefinition within Transformation). In steps 1 and 2 the learning content is enhanced (Substitution) and improved (Augmentation) by the technology, in steps 3 and 4 the technology is exploited to making changes in educational forms (Modification), or completely new forms are used which could not be enabled without the technology (Redefinition). In other words, at the Substitution level, identical tasks and activities are performed as can be conducted without exploiting technology, i.e. there is not any functional change in teaching and learning. At the Augmentation level, the technology works as an effective tool enhancing the process of instruction; thus students may become more involved in the process. At the Modification level, the first step is made between enhancing the 'traditional' teaching/learning and accomplishing substantial changes within this process through the use of technology. This is a significant change; new methods and tools are used that enable e.g. listening activities, rewriting etc. Finally, at the Redefinition level, completely new approach and strategy are applied that could not be allowed without technology—it is not the target but the means enhancing student's learning, often tailored to the individual learning preferences, and learning objectives are reached through collaboration, discussions etc.

The above described theoretical background was applied in the design of blended learning model which was exploited for acquiring selected English grammar phenomena. As the learners were of adult age (above 20 years), who had built their preconcepts within previous studies at various types of educational institutions (compulsory primary, lower and upper secondary schools) and also through other learning activities (e.g. attending language schools and courses, private lessons, travelling and working abroad etc.), the correctness of their preconcepts was checked so as potential misconcepts could be reconstructed (modified). To succeed in this process, characteristics of efficient learning were included in the design of the blended learning model (Table 1). After implementing all these characteristics, learning through the blended model finally results in creating new associations within existing structures.

Table 1 Theoretical background reflected in the blended learning model of acquiring selected English grammar phenomena. *Source* Own

From the view of preconcepts, misconceptions, constructivism	Reflection in the blended learning model
Problem-solving and discovering new knowledge is accompanied by learner's joy and brings satisfaction	Most of current students consider latest technologies/devices helpful for education and their frequent use brings them pleasure and entertainment both in common life and education*. Moreover, the content of their (future) profession is reflected in the exploitation of professional vocabulary
Learners feel success	The feeling of success is based on enjoyment of their favourite technologies and devices, on private and professional satisfaction
Learners are praised and awarded	Positive feelings, motivation and consequent involvement into learning result in teacher's positive feedback
Learners gain individual experience and experiences	Blended learning enables individual (autonomous) work, from the out-of-school environment, which brings both the experience and experiences
Learning process reflects learner's individual abilities and preferences	Latest technologies/devices provide learners with various tools and approaches which enable each of them to select the most appropriate way towards reaching educational objectives
Learning process does not stress the learner	Neither any part of the testing, nor the student's results were open to the others; in case of failure, the student did not suffer from negative feedback from the others
New knowledge is built through as many as possible senses simultaneously	The wide scale of technological tools and didactic approaches enables learners to collect information and develop new knowledge exploiting various/all senses
New knowledge is built using ways which cannot be possible without latest technologies and devices	The SAMR model can be applied; particularly Modification and Redefinition phases are enabled by latest technologies/devices**

*Simonova (2018); **Netolicka and Simonova (2017)

Blended approach to learning English grammar at the faculty of informatics and management and the faculty of education

In the Czech Republic as part of Europe, knowledge of English language is considered according to the Common European Framework of Reference for Languages (CEFR), which is a document elaborated by the European Council. It introduces a uniform system of evaluation for the levels of foreign language knowledge for all the major European languages. Considering the level of understanding when listening, reading and the ability to speak, as well as the quality of writing, six levels of knowledge are defined (A1, A2, B1, B2, C1, C2) as follows:

- *Basic user* A1 (breakthrough, or beginner), A2 (waystage, or elementary);
- *Independent user* B1 (threshold, or intermediate), B2 (wantage, or upper intermediate);
- *Proficient user* C1 (effective operational proficiency, or advanced), C2 (mastery, or proficiency).

This approach rather easily enables to see the level of knowledge and evaluate the qualification (CEFR 2001).

The upper secondary school graduates in the Czech Republic are required to reach B1 level of CEFR. Despite this fact, however, the real state differs in some cases—some university applicants do not meet this precondition and yet they enter the university where they are expected to improve their knowledge and eliminate this shortcoming as soon as possible.

At the *Faculty of Informatics and Management (FIM)*, University of Hradec Kralove (UHK), in the part-time bachelor study programme of Applied Informatics and Information Management, English for Specific Purposes (ESP) is taught for four semesters (ESP1–ESP4). So as to enable weak students to reach the required B1 level of knowledge, special courses are held for the first-year university students; and consequently, they start attending ESP courses in the third of six semesters of bachelor studies. Moreover, students' knowledge of grammar is finalized in the ESP1 course. Then, other courses target at developing the skill of reading comprehension of professional texts (ESP2), written communication (ESP3) and oral communication and presentation (ESP4). Before bachelor graduation, students are required to reach the B2 level of CEFR.

In each semester (12 weeks long) the blended approach is applied combining 24 face-to-face hours (45 min each) taught in four six-hour blocks in the classroom and autonomous learning within appropriate ESP course in the learning management system (LMS) Blackboard. It was originally designed as the learning environment, so it is able to meet all the requirements and features that enhance the process of teaching and learning. It means it provides tools for displaying study materials in various forms (fulltext, hypertext, presentations, animations, figures, table etc.), for conducting teacher/student and student/student communication, sharing materials and messages, for practising and testing new knowledge with immediate correction, explanations and links to the appropriate part of study

materials so as to focus on deeper learning, which is highly important particularly in autonomous (e-)learning.

At the *Faculty of Education (FE)*, University of Jan Evangelista Purkyně (UJEP), Usti nad Labem, higher level of knowledge is required from the first-year students of the bachelor study programme of English language and literature. As the amount of applications highly exceeds the number of admitted students, the process is very competitive and only the best ones succeed, reaching the B2 level as minimum. English grammar is taught in six courses of Practical Language (PL) during the bachelor study programme, where all four language skills are under the focus, including the grammar and professional vocabulary from the field of linguistics and literature. Moreover, all subjects within this study programme are taught in English. Online courses for each subject are available to the students in LMS Moodle. However, compared to LMS Blackboard exploited by FIM students, not all the tools are available on the same (user-friendly) level in this LMS, and FIM students exploit their LMS to a wider extent (Simonova and Poulouva 2017). During the semester (12 weeks long) students attend two face-to-face lessons per week (45 min each) where mostly direct communication activities are conducted, and they also have additional materials for reading, practising and testing their knowledge available in the LMS for autonomous learning. At the end of the second semester, they are required to reach the C1 level of knowledge according to the CEFR, for the bachelor exam the C2 level is required.

Methodology

Reflecting the fact that blended learning is considered a standard approach, researches in this field are highly required. The basic question is whether learning results developed within this process entitle teachers and educational institutions to implement it into the process of instruction so as learners reached required knowledge.

Research objective

The main objective of this research is to explore how much students learn, if selected phenomena of English grammar in English for Specific (technical, or educational) Purposes are acquired within the process of blended learning which in this case combines face-to-face lessons, autonomous e-learning within LMS (Blackboard, or Moodle) and from various e-sources.

Research sample

Totally, 123 students (N) participated in the research: 61 FIM students enrolled in the subject of ESP1 in Applied Informatics and Information Management part-time bachelor study programme and 62 FE students attending the subject of PL in the English Language and Literature bachelor study programme.

In the FIM group, the knowledge of general English was estimated according to the results of entrance exam as follows: A1 of CEFR level—14 students, A2—28 students, B1—17 students, B2—2 students. Other four students reached C1 level certificates, two students had C2 certificates. These six students worked with English-speaking companies; therefore, their learning content in ESP1 was individualized (e.g. they co-operated in ESP project) so as to reflect and develop their higher level of knowledge; these six students were not included in the research sample. Despite the gender and age were not considered within the research results, ten students were females (16.4%), the age of 48 respondents (78.7%) was in the range of 24–36 years, the whole sample was spread in the range of 19–44 years.

In the FE group, the students' level of general English was defined by the results of entrance exam: B2 of CEFR level—32 students, C1 of CEFR level—34 students. Nearly half of them (29) were males (46%), the age of 40 students (65%) was in the range of 19–23 years, the age of 22 students (35%) was in the range of 24–36 years. The research sample structure based on the results of entrance exam reflecting the level of English knowledge according to the CEFR is displayed in Fig. 1.

As clearly visible from Fig. 1, FIM and FE groups fully differ in the level of English knowledge detected within the entrance exam. However, pre-test scores in the FIM group and FE group were nearly equal (see descriptive statistics in Tables 1 and 2 below).

Research method, tool, process and hypotheses

The research was conducted in two independent research groups—FIM students and FE students. Each research was held in another time period and place (FIM: 2016/17, Hradec Kralove; FE: 2017/18, Usti nad Labem). Each group of students focused on different fields of study—the FIM group on information technologies, the FE group in English language and literature (see the description of research sample). Reflecting the field of study (information technologies), FIM students had wider experience in working in LMS. The field of study was reflected in the research design where both the technologies and English language were implemented, thus forming the blended model of learning. The research results (test scores of pre-test, post-test1, post-test2) were collected separately.

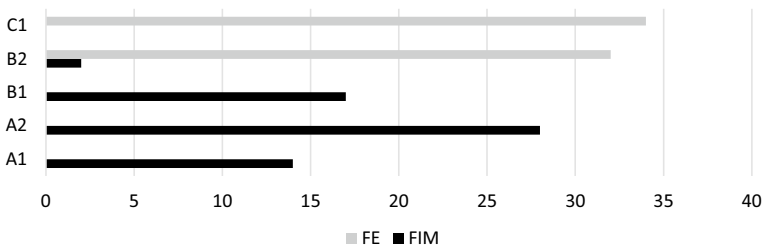


Fig. 1 Research sample structure based on the results of entrance exam reflecting the level of English knowledge according to CEFR (N). *Source:* Own

Table 2 Characteristics of the research process. *Source:* own

Characteristics	Pre-test	Post-test1	Post-test2
Objective	Monitor learners' preconcepts	Detect potential misconceptions	Detect potential misconceptions
Task	Write a sentence appropriate to each English grammar phenomenon	Write a sentence appropriate to each English grammar phenomenon	Write a sentence appropriate to each English grammar phenomenon
Directions	Use own previous knowledge of English grammar	Read English professional texts. Reflect teacher's feedback on your pre-test result	Reflect teacher's feedback on your post-test1 result and own knowledge built on reading English professional texts
Type of answer	Open-answer	Open-answer	Open-answer
Form of the test	Present (in the classroom)	Distance (out of school)	Present (in the classroom)
Use of vocabulary	General, or professional	Professional	Professional
Use of didactic aids	None	Any	None

The research process exploring the blended model of learning was structured into three phases.

Within the first phase, when learners' pre-concepts were monitored, the pre-test was administered on the first face-to-face lesson of ESP1/PL before the process of acquiring new learning content started. Students received a list of 44 grammar phenomena in the electronic form (the terminology of phenomena was both in English and Czech language). They were to write a simple sentence containing each phenomenon in appropriate context (e.g. for Past Simple tense: I graduated from the grammar school last year). I am looking forward to meeting you soon). For the purpose of the research the phenomena were divided in two groups which followed the CEFR requirements for A2 (Basic user—elementary level) and B1 (Independent user—intermediate level) groups:

In A2 group (according to CEFR), following 20 phenomena were listed (G1–20): Irregular Noun in plural; Uncountable Noun; Comparative or Superlative form of Adverb; Present Simple tense; Present Continuous; Past Simple Past Continuous; Future action expressed by Will, Going to, Present Continuous; Present Perfect Simple; Present Perfect Continuous; Past Perfect; Past Perfect Continuous; Modal verbs; There is/There are; Would rather; Had better.

In B1 group (according to CEFR), following 24 phenomena were included (G21–44): three types of Conditional sentences; Future Perfect Simple; Future Perfect Continuous; Wish clauses for the Present and Past; expressing the Purpose; Time clause for future actions; Relative clause; word order in Indirect speech; Sequence of tenses; Subject with Infinitive structure; Object with Infinitive structure; Modal verb with Past Infinitive; Gerund or Infinitive form; Have Something Done structure; Used to with Infinitive; Used to with -ing form; Make/Do sentences; Who/What question; Question tags; So am I/Neither am I.

The time period for completing the appropriate sentences was 70 min. After the lesson, the list was submitted to the LMS Blackboard. Each sentence was assessed by the teacher (one point per correct sentence; maximum test score was 20 points for G1–20 part, and 24 points for G21–44 part). These results are called the pre-test scores further on.

Within the second phase, after receiving teacher's feedback on pre-test results towards rebuilding misconceptions, autonomous learning was applied: students read texts relating to their field of study and work, i.e. professional books, articles in journals, manuals, novels, stories etc. Based on student's decision and equipment, the search for sources can be supported by latest technologies and devices, i.e. selected phases of the SAMR model can be applied. They focused on the 44 listed grammar phenomena, and when one was found, the whole sentence containing the appropriate grammar phenomenon and professional vocabulary was added to the list, including the reference to the source (e.g. for Past Simple tense: Microsoft released Windows Vista at the end of 2006. Source: Savill, J. The Complete Guide to Windows Server 2008. Addison-Wesley Professional, 2008, p. 17). So as to create as good as possible list of sentences, students were allowed (or even encouraged) to use both printed and e-sources for reading and to exploit various learning aids, e.g. a presentation created by the teacher and providing the summary with description of all required grammar phenomena and few samples, any grammar book or student's book with exercises

and the key, web pages relating to learning English, printed and e-dictionaries etc. Moreover, they could conduct discussions, both in the LMS or on social networks, to consider the appropriateness (in/correctness) of single sentences, to share sources and methods of searching for single phenomena. Thus the misconceptions could have been corrected (reconstructed) and new concepts built. In the FIM group, 2684 sentences should have been submitted. Despite students were informed that the task would not be considered completed if they did not fill in all 44 phenomena, eight sentences were missing. In total, 2676 sentences were submitted; 2194 sentences (82%) were collected from e-sources. In the FE group, 2728 sentences should have been provided, however, four sentences were missing. In total, 2724 sentences were submitted; 1227 sentences (45%) were collected from e-sources.

The total time for completing the list was 6 weeks; then, it was submitted through the LMS and assessed by the teacher as post-test1. Identically to the pre-test, one point per correct sentence was scored (maximum score was 20, resp. 24 points). The teacher provided feedback to each student—correct and incorrect sentences were distinguished and links to study materials with further explanations were provided to the student. As the amount of sentences was high, the feedback was sent within 2 weeks, 1 month before the end of semester as minimum. Advanced students completed the list of sentences in the time shorter than 6 weeks, so the “first come first served” principle in providing the feedback was applied by the teacher. Then, student’s task was to study the feedback and continue the process of acquiring the grammar; and if needed, to contact the teacher for further support. As the online courses in LMSs were available through computers, notebooks, smartphones and other mobile devices, the blended learning approach was applied combining face-to-face lessons and autonomous work supported by latest devices and technologies.

Within the third phase, after autonomous learning and receiving teacher’s feedback on post-test1 results towards changing misconceptions, student’s final knowledge was tested at the end of semester in the form of face-to-face post-test2. The task was to write simple sentences using professional (technical/language and literature) vocabulary and showing each grammar phenomenon in the context (e.g. for Past Simple tense: Microsoft officially stopped supporting it; consequently, the PHP development community decided that dropping the support was a wise decision.). This task was rather difficult because not only the knowledge of grammar phenomena, their structure and spelling, but also the context and professional vocabulary were required. No didactic aids were allowed during the testing. Identically to the pre-test and post-test1, one point per correct sample was scored (maximum score was 20, resp. 24 points). This result is called the post-test2 score. Summary of the research process characteristics is displayed in Table 2.

We consider important to state that despite some of above mentioned characteristics of the model differ, both the process of learning and testing learners’ knowledge were applied in the identical way in both the FIM and FE students: the task and type of answers in tests did not differ. However, students’ autonomous learning after pre-testing was applied in both groups, and consequently the result of this phase—the list of sentences collected when reading professional texts and using any types of didactic aids (electronic, printed)—was considered the post-test1 (identically in both the groups). From the methodological view, this approach is relevant and the

requirement of identical preconditions for both groups considered in the research is met.

So as to implement the above described theory and reach the main research objective, i.e. to discover how much students learn, if selected phenomena of English grammar in ESP/PL are acquired within the process of blended learning, eight hypotheses were set, distinguishing the level of English grammar (G1–20, G21–44) and scores in pre-test/post-test1 and post-test1/post-test2 in the groups of FIM and FE students:

H1: There exists the statistically significant difference between pre-test and post-test1 scores in the group of grammar phenomena G1–20 with FIM students.

H2: There exists the statistically significant difference between post-test1 and post-test2 scores in the group of grammar phenomena G1–20 with FIM students.

H3: There exists the statistically significant difference between pre-test and post-test1 scores in the group of grammar phenomena G1–20 with FE students.

H4: There exists the statistically significant difference between post-test1 and post-test2 scores in the group of grammar phenomena G1–20 with FE students.

H5: There exists the statistically significant difference between pre-test and post-test1 scores in the group of grammar phenomena G21–44 with FIM students.

H6: There exists the statistically significant difference between post-test1 and post-test2 scores in the group of grammar phenomena G21–44 with FIM students.

H7: There exists the statistically significant difference between pre-test and post-test1 scores in the group of grammar phenomena G21–44 with FE students.

H8: There exists the statistically significant difference between post-test1 and post-test2 scores in the group of grammar phenomena G21–44 with FE students.

Results

Data collected from FIM and FE students in pre-test, post-test1 and post-test2 in G1–20 and G21–44 phenomena were processed by appropriate statistic methods and the statistical significance of differences was considered. Results are structured into two parts: (1) descriptive statistics and (2) testing hypotheses.

Descriptive statistics

Results of descriptive statistics are displayed in Table 3 for grammar phenomena G1–20 and in Table 2 for G21–44 grammar phenomena. They present the values

Table 3 Descriptive statistics: FIM UHK, FE UJEP in G1–20 *Source:* Own

	FIM UHK			FE UJEP		
	Pretest	Post-test1	Post-test2	Pretest	Post-test1	Post-test2
N	61	61	61	62	62	62
Mean	15.52459	18.11475	17.21312	14.66129	18.06452	18.24194
SD	3.495743	1.89823	2.921842	3.732636	2.373839	2.288141
Min	4	13	6	6	6	6
Max	20	20	20	20	20	20
Range	16	7	14	14	14	14
Median	16	19	18	15	19	19
Mode	16	20	18	15	19	19
Shap.-Wilk.	0.7762979 (R)	0.8616919 (R)	0.7808502 (R)	0.934037 (R)	0.7208476 (R)	0.6770014 (R)
Kolm.-Smir.	0.2753996 (R)	0.2205023 (R)	0.2291058 (R)	0.1054929 (CNR)	0.2661424 (R)	0.2749529 (R)

Shap.-Wilk. Shapiro–Wilk W test; *Kolm.-Smir.* Kolmogorov–Smirnov test; *R* reject normality; *CNR* cannot reject normality

of total amount of respondents (N), Mean, Standard Deviation (SD), Minimum and Maximum score, Score range, Median, Mode and results of two tests of normality data distribution (Shapiro–Wilk W test and Kolmogorov–Smirnov test).

As clearly seen mainly from the Mean values of grammar phenomena G1–20 (Table 1), in the FIM group, the pre-test score was 15.5 points. After six-week long study period in the online ESP1 course, the post-test1 score increased to 18.1 points. However, in the final post-test2 the score decreased to 17.2 points (maximum score was 20 points in each test). In the FE group, the pre-test score was slightly lower compared to FIM—14.6 points. After six-week long study period in the online PL course, the post-test1 score increased to 18.06 points, and 18.24 in the post-test2.

Table 4 displays test scores for grammar phenomena G21–44. The Mean values show that in the FIM group, the pre-test score was 13.8 points. After six-week long study period in the online ESP1 course, the post-test1 score increased to 17.4 points. However, in the final post-test2 the score decreased to 12.9 points (maximum score was 24 points in each test). This result is discussed in the final chapter Discussions and Conclusions. In the FE group, the pre-test score was again lower compared to FIM—11.03 points. After six-week long study period in the online PL course, the post-test1 score increased to 16.1 points and to 16.7 points in the post-test2.

To sum up, within G1–20 grammar phenomena in the FIM group, the test score was higher compared to FE before the blended learning was applied, it increased slightly after autonomous learning from the online course but finally it decreased, however, not below the starting level. In FE group the post-test1 score increased after the autonomous learning from the online course and increased again after teacher's feedback in post-test2. Within G21–44 grammar phenomena in the FIM group, the test score was higher again compared to FE before the blended learning was applied, it increased after autonomous learning from the online course

Table 4 Descriptive statistics: FIM UHK, FE UJEP in G21–44 *Source:* Own

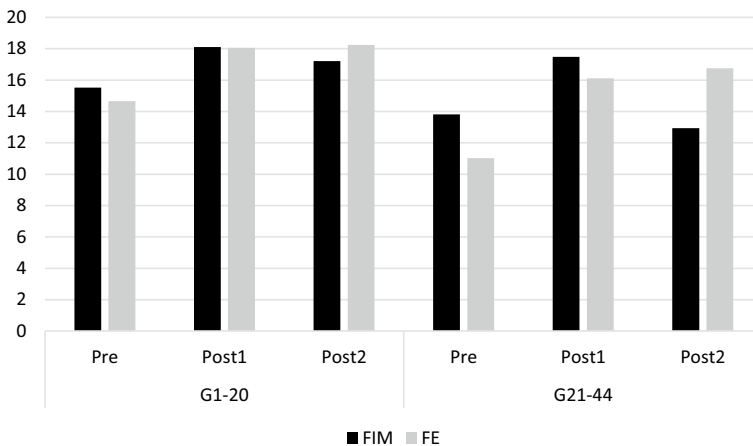
	FIM UHK			FE UJEP		
	Pretest	Post-test1	Post-test2	Pretest	Post-test1	Post-test2
N	61	61	61	62	62	62
Mean	13.81967	17.4918	12.93443	11.03226	16.1129	16.75806
SD	6.18468	5.448617	6.500946	6.04347	5.008533	4.5075
Min	0	1	1	2	5	7
Max	24	24	24	22	23	23
Range	24	23	23	20	18	16
Median	15	18	14	11	17	18
Mode	17	24	–	3	22	18
Shap.-Wilk.	0.9556006 (R)	0.9231352 (R)	0.9571066 (R)	0.9331367 (R)	0.944047 (R)	0.9379931 (R)
Kolm.-Smir.	0.1181878 (R)	0.1199856 (R)	0.08558426 (R)	0.1361962 (R)	0.114572 (R)	0.1246731 (R)

Shap.-Wilk. Shapiro–Wilk W test; *Kolm.-Smir.* Kolmogorov–Smirnov test; *R* reject normality

in post-test1 but finally it decreased below the starting level in post-test2. In FE group the test score increased after the autonomous learning from the online course in post-test1 and increased again after teacher's feedback in post-test2.

Mean values of FIM and FE groups are displayed in Fig. 2.

The normality of data distribution was rejected by the statistic tests in in FIM and FE groups, in pre-test, post-test1 and post-test2, and in all groups of G1–20 and G21–44 grammar phenomena. Reflecting this result, non-parametric test (Wilcoxon Signed-Rank test) was applied for verification of all hypotheses.

**Fig. 2** Test scores: mean values of FIM and FE groups. *Source* Own

Testing hypotheses

Hypotheses were tested in two steps: (1) the results of hypotheses H1 and H2 for the FIM group, H3 and H4 for the FE group dealing with grammar phenomena G1–20 are presented; (2) the results of hypotheses H5 and H6 for the FIM group, H7 and H8 for the FE group dealing with grammar phenomena G21–44 are displayed.

Grammar phenomena G1–20

First, the paired difference (dif.) for pre-test score and post-test1 score of the FIM group was calculated for grammar phenomena G1–20 by Wilcoxon Signed Rank test. Reaching the Z -value = 6.3755, the first hypothesis *H1 was verified* ($\alpha = 0.05$; probability level = 0.000000). This result means that statistically significant difference was discovered between the pre-test and post-test1 scores.

Second, the paired difference for post-test1 score and post-test2 score of the FIM group was calculated for grammar phenomena G1–20 by Wilcoxon Signed Rank test. Reaching the Z -value = 1.6783, the second hypothesis *H2 was falsified* ($\alpha = 0.05$; probability level = 0.093288). This result means that statistically significant difference *was not* discovered between the post-test1 and post-test2 scores. However, the post-test1 *score slightly decreased*.

Third, the paired difference for pre-test score and post-test1 score of the FE group was calculated for grammar phenomena G1–20 by Wilcoxon Signed Rank test. Reaching the Z -value = 6.6667, the first hypothesis *H3 was verified* ($\alpha = 0.05$; probability level = 0.000000). This result means that statistically significant difference was discovered between the pre-test and post-test1 scores.

Fourth, the paired difference for post-test1 and post-test2 score for the FE group was calculated for grammar phenomena G1–20 by Wilcoxon Signed Rank test. Reaching the Z -value = 2.6381, the first hypothesis *H4 was verified* ($\alpha = 0.05$; probability level = 0.008337). This result means that statistically significant difference was discovered between the post-test1 and post-test2 scores.

Grammar phenomena G21–44

First, the paired difference for pre-test score and post-test1 score of the FIM group was calculated for grammar phenomena G21–44 by Wilcoxon Signed Rank test. Reaching the Z -value = 6.1518, the third hypothesis *H5 was verified* ($\alpha = 0.05$; probability level = 0.000000). This result means that statistically significant difference was discovered between the pre-test and post-test1 scores.

Second, the paired difference for post-test1 score and post-test2 score of the FIM group was calculated for grammar phenomena G21–44 by Wilcoxon Signed Rank test. Reaching the Z -value = 4.0515, the fourth hypothesis *H6 was verified* ($\alpha = 0.05$; probability level = 0.000051). This result means that statistically significant difference *was* discovered between the post-test1 and post-test2 scores. However, the post-test2 *score significantly decreased*.

Third, the paired difference for pre-test score and post-test1 score of the FE group was calculated for grammar phenomena G21–44 by Wilcoxon Signed

Rank test. Reaching the Z -value = 6.2706, the third hypothesis $H7$ was verified ($\alpha=0.05$; probability level = 0.000000). This result means that statistically significant difference was discovered between the pre-test and post-test1 scores.

Fourth, the paired difference for post-test1 score and post-test2 score of the FE group was calculated for grammar phenomena G21–44 by Wilcoxon Signed Rank test. Reaching the Z -value = 3.7282, the fourth hypothesis $H8$ was verified ($\alpha=0.05$; probability level = 0.000193). This result means that statistically significant difference was discovered between the post-test1 and post-test2 scores.

Z -values and p -values are displayed in Table 5.

To sum up, in the FIM group, in G1–20 grammar phenomena, the results show the statistically significant increase in post-test1 score compared to pre-test (+2.59); however, the decrease was detected in post-test2 score compared to post-test1 (−0.9). In G21–44 group the statistically significant increase was even higher in post-test1 compared to pre-test (+3.68); however, the sharp and statistically significant decrease was discovered in post-test2 score compared to post-test1 (−4.56). When total differences between pre-test and post-test2 scores are compared, the increase of +1.69 was calculated in G1–20 group and the decrease of −0.88 in G21–44 group of English grammar phenomena.

In the FE group, in G1–20 group the results show the statistically significant increase in post-test1 score compared to pre-test (+3.403); and further significant increase was detected in post-test2 score compared to post-test1 (+0.177). In G21–44 group the statistically significant increase was even higher in post-test1 compared to pre-test (+5.0807); and further significant increase was discovered in post-test2 score compared to post-test1 (+0.645). When total differences between pre-test and post-test2 scores are compared, the increase of +3.580 was calculated in G1–20 group and +5.725 in G21–44 group of English grammar phenomena.

Table 5 Z -values and p values. Source: Own

		G1–20		G21–44	
		Dif. pre-post 1	Dif. post1-post 2	Dif. pre-post 1	Dif. post1-post 2
FIM	z score	6.3755	1.6783	6.1518	4.0515
	p score	0.000000	0.093288	0.000000	0.000051
	Hypothesis	H1 accepted	$H2$ rejected; non-significant decrease	H5 accepted	H6 accepted; significant decrease
FE	z -score	6.6667	2.6381	6.2706	3.7282
	p score	0.000000	0.008337	0.000000	0.000193
	Hypothesis	H3 accepted	H4 accepted	H7 accepted	H8 accepted

Paired difference: Dif. (Source: own)

Discussions and conclusions

To sum up, hypotheses H1, H3, H4, H5, H7, H8 were verified proving statistically significant increase in test scores; hypothesis H2 was falsified as the statistically significant difference was not detected; and statistically significant difference (decrease in test score) was discovered in H6.

When briefly considering this result, it may seem clear the blended approach works efficiently in teaching/learning English grammar. However, the detailed focus discovers that in two test scores of FIM group significant increases were not detected:

- in post-test1—post-test2 (H2), the slight (not significant) decrease was detected in the group of G1–20 grammar phenomena (−0.9);
- in post-test1—post-test2 (H6), the statistically significant decrease was discovered in the group of G21–44 grammar phenomena (−4.56).

As mentioned in the Methodology chapter, grammar phenomena in G21–44 group are more demanding to be acquired compared to G1–20; however, all of them should have been acquired in the subject of ESP1 as minimum (FIM graduates from this course are expected to reach B2 level according to CEFR). The test score of FE students was rising step-by-step showing statistically significant increase in each test score. Reflecting these results, we can conclude that the blended model of learning worked efficiently in both groups; however better results were detected in FE group. There may be several reasons of this state. We do not think anyone of those listed below is able to work separately as the most important one. Nevertheless, they are interconnected to some extent and each of them could have contributed to the discovered findings.

First, the main reason of the of the discovered state might be *the starting level of English knowledge*. This level was higher with FE students (see Fig. 1 for CEFR levels and Table 1 for pre-test scores). In spite of the fact, the level of all students' knowledge was clearly defined by the syllabus and study programme (generally, B2 as minimum at the beginning of higher education studies in the Czech Republic), not all of FIM students met the requirements before they enrolled in the ESP1 course and the research started (see chapter Research sample). As reflected by the course teacher, some of them worked hard towards improvements—they attended private lessons, paid preparatory courses held by the faculty, contacted the ESP teachers for consultations before the course started and during the semester. Nevertheless, they had difficulties and finally, some of them were not able to acquire the whole learning content of the ESP1 course—either from the reason of low entrance level of knowledge, or lack of effort. Besides these reasons, lack of actively produced language might have been a cause of this state. In other words, FIM students were good at working with professional texts when searching the sample sentences. However, their active production of appropriate sample ones in the written form was significantly lower. Reflecting author's 20-year long experience in teaching at FIM, we can speculate FIM students compared to

FE ones prefer reading professional texts to active speaking/writing, whereas FE students are better in spoken communication. Then, this fact was reflected in test scores, particularly of advanced grammar phenomena G21–44. Students, often false beginners, were not able to master them, which definitely provided impact on final test scores. Moreover, the ESP1 and PL courses were designed in *different LMSs*, which also could have provided impact on the test scores. However, the decision on choosing one or the other LMS was under the responsibility of the faculties/universities, not the participating students.

Second, students' previous experience in blended learning might play an important role within the research. Teacher's impact was not considered, as the same person was teaching both groups. Whereas FIM students had rather large experience in working in LMS, with e-sources, e-study materials, e-applications and software running on both non-portable computers and portable notebooks, tablets, smartphones and other types of mobile devices, FE students were mostly exposed to the direct (face-to-face) method of teaching (by real teacher), and the LMS, devices, applications and software were mostly exploited for their autonomous (home) work. This difference in experience in blended learning might have been a cause of low test score in the pre-test, despite the CEFR level of knowledge detected in the entrance exam was higher in FE group than in FIM group (see Fig. 1). In the period of autonomous studying before post-test1, FE students were trying to diminish this shortcoming.

Third, irrespective of the starting level of English knowledge, both the FIM and FE students had problems with terminology, i.e. most of them did not know the names of single grammar phenomena, both in Czech and English languages.

Fourth, student's effort, motivation and individual ability to learn autonomously, which were not intentionally considered/measured, also provided impact on the research results: honestly, not all students are able to learn and/or practise the learning content autonomously, including working with information provided by the teacher and finding appropriate sources. As widely accepted, these factors relate to general intelligence and many other personal characteristics (Kim, 2012). Irrespective of the quality of the teaching process and how strongly the learner is enhanced (by the teacher, LMS, or other didactic means), the positive effects of learning may not appear. Regardless the fact how helpful face-to-face lessons and autonomous work are Spector and Merrill (2008), the blended approach cannot work efficiently in acquiring new and demanding learning content with not-hardworking students.

Fifth, irrespective of a lower level of English knowledge with some FIM students, the appropriateness and/or efficiency of autonomous study in acquiring still unknown learning content is important. We agree it is very difficult to acquire completely new and difficult learning content, even if the blended learning comprises of face-to-face lessons (where students can ask for immediate additional explanation, examples, feedback) and autonomous homework supported by other explanations and tests in LMS course.

Sixth, in accord with high self-confidence and self-assurance of an individual, which are required by current system of personal presentation, student's high self-evaluation of own knowledge and performance, is astonishing in some cases, even if supported by educational institutions and companies. However, the reflection to

the real state is highly needed. Failing that, students and young undergraduates may overestimate their knowledge, strengths, and not succeed in their activities in the end (Rican, 2016). This feature was observed with most of FIM students who were seemingly proud of their knowledge and skills in the field ICT but they did not realize the rather low level of application in the learning content of English grammar. On the other side, FE students whose IT skills are often underestimated were doing well, particularly in searching for study materials when studying for post-test1 and in searching sentences for post-test2.

Last but not least, being aware of the fact that the task required in post-test2 was difficult, as the *application of new knowledge always is*, the low(er) test score is not so surprising. Students had been informed that their activities and efforts relating to grammar would be part of their final credit test but they did not know the concrete form of the task. As a result, they could not concentrate on one particular activity in their preparation. In the real post-test2, they were required to apply various types of language knowledge, i.e. actively produce appropriate grammar sentences without the support of various learning aids, as they were allowed in post-test1 (e.g. search engines, electronic grammar books etc.) and exploit the professional vocabulary relating to their field of study in them. The difficulty of the task might have been a reason of low(er) test scores in post-tests2 of FIM students whose starting knowledge of English was lower compared to FE students (see Fig. 1).

As summarized by Uskov et al. (2017), student's personal characteristics, particularly motivation to learn but also learning style preferences, effort to learn, level of starting knowledge, appropriateness of didactic means used in the process of (blended) teaching/learning, are the main criteria which play substantial role, whatever type of learning we have in mind. The blended learning concept has been applied in higher education for years, and currently, it has been mainly conducted within smart environments and approached through smart devices. However, to compare the research results to identical/similar ones was not possible because not such a research design was described in publications listed in recognized databases. Learners' progress was considered by Elhoseny et al. (2018) who focused on innovations, particularly making the learning environment adaptable to learner's individual needs (dealing with both sensory preferences and level of knowledge).

Carey et al. (2015) evaluated the validity of teaching English grammar to pre-service teachers (which some of the FE students are going to become) and proved the positive contribution of the blended learning for this purpose. Their quasi-experimental study discovered a 10% improvement in post-test scores compared to pre-test knowledge ($p < 0.001$).

Not only test scores but also students' perception of blended learning is crucial for reaching success (building learning outputs) in blended learning. Whereas in Europe (European towns and cities) the technical problems with the Internet connection and distance sources had been solved, in developing countries, as Wright (2017) states, the blended learning is "... in its early stages and not without its challenges. Asynchronous online lessons are currently still more prevalent in many areas of South-East Asia, perhaps due to potential difficulty in obtaining strong Internet connections, which may deter educators from synchronous options"[abstract]. She monitored how the blended approach was perceived by

Malaysian EFL students ($N = 112$) compared to face-to-face lessons using open-ended questions and Likert-scaled statements for final content analysis. The results showed students' interest in blended learning was slightly lower (19.6% expressed strong agreement, 43.8% agreement) compared to face-to-face learning (25% strong agreement, 45% agreement). As widely accepted, the blended approach was appreciated for its individualization (convenience, time and place flexibility, pace etc.), whereas providing stronger motivation and involvement were the main features characterizing the in-class learning.

On the other side, blended learning is positively accepted by numerous students. Pinto-Llorente et al. (2017) conducted a quantitative study of 358 students (aged 29–58 years) focusing on the process of improving grammatical competence. Students mainly highlighted the learning autonomy in learning ESL (English as Second Language)—pace, time, sentences for practising single phenomena in real context, and the possibility of online testing. Authors also proved that students' knowledge of English grammar, including theoretical rules, improved Pinto-Llorente et al. (2015).

The implementation of SAMR model reflecting the Bloom's taxonomy of educational objectives was proposed by Netolicka and Simonova (2017). The model applies two phases (the enhancement and augmentation) and four steps within the process of acquiring new knowledge—(1) substitution (i.e. technology acts as direct tool substitute without no technology change), (2) augmentation (i.e. technology acts as direct tool substitute with functional improvements), (3) modification (i.e. technology allows for significant task redesign) and (4) redefinition (i.e. technology allows creation of new task, previously inconceivable). Authors provided a detailed methodology how the model can be efficiently implemented and introduced results of pilot testing, including learners' and teachers' feedback. Follow-up results proved both significantly better knowledge and differences in learners' performance in the group working with iPads compared to students not using them (Netolicka and Simonova, 2017).

Additionally, Liu et al. (2017) developed a new computer-assisted learning system called starC which enhances teachers and learners to operate the learning activity through the whole learning process. They proposed a new learning pattern based mainly on the collaborative learning in the flipped environment and applied it in English classes on the higher education level. They discovered that within this pattern, students in the experimental group produced better results particularly in speaking but also in grammar, reading and writing compared to the control group where this approach was not applied.

Emphasizing the student-centered learning, Kayaoglu et al. (2015) focused on the role of web-based grammar instruction system, students' results and perceptions of this approach. They compared scores in four achievement tests of English language with students who practised English grammar in the online grammar lab ($N = 73$) and in the class ($N = 57$); the rest of the teaching process in both groups was conducted in the class, so we can consider this approach as blended. The results discovered higher test scores in favour of the group working in the online grammar lab. Unfortunately, authors did not describe in detail what the lab and class activities were.

Last but not least, teaching/learning English grammar enhanced by LMS Moodle was researched by Shechter (2015). After analyzing the available tools, he proposed a model which paid strong attention to engaging students in learning activities, and discussed parameters which should be considered in designing a blended learning course, focusing mainly on acquiring the vocabulary, grammar, reading, and on testing new knowledge. The main objective of his work was to give teachers confidence and basic inspiration how to enhance the process of teaching English. However, nowadays, a few years after Shechter's research, technologies provide numerous, much more interesting tools and strategies which are expected to attract learners' attention and work efficiently. Even though the main didactic principles are identical for centuries (Comenius, 1930), fast development of latest technologies offers both the teachers and learners new ways how to exploit them for educational purposes. Reflecting this state, teachers are facing new IT skills to be mastered and the teacher's role is changing. However, they will always work as an important factor in the process of acquiring the new knowledge, irrespective of the extent the technologies will take within the process of blended learning. And, for millennial learners, even if perceiving the process of learning in a different way compared to the current middle-age and older generations (e.g. Trembach and Deng, 2018; Djiwandono, 2017), the interest, motivation, engagement in any activity within the process of learning, not only in particular subjects but the lifelong learning, must be applied to maximum extent. Therefore, further on, the main research questions should focus on these fields.

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