A fresh look at blended learning: boosting motivation and language acquisition in an ESP course for engineering students

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ABSTRACT: Blended learning in English for specific purposes (ESP) is evolving with the current situation in the world. Blended learning is gaining popularity as it serves the purpose of motivation and efficiency improvement in the realms of uncertainty and distance learning. However, the optimal adjustment of traditional and digital components of an ESP course is yet to be found. The aim of the study is to work out a blended learning model in ESP for engineering students to improve their motivation and efficiency of language acquisition. The study provides a four-componential frame model of the content for a blended ESP course for engineering students. Learning outcomes and motivation enhancement results were assessed and analysed to reveal the effectiveness of the proposed model. Gender-based motivation and satisfaction with distance learning were initially studied to better understand the needs of students, and thus design a targeted course. The results of the experiment show that the blended learning model proved to be more effective in both aspects, improving motivation and academic performance. Its ultimate advantage is the flexibility which makes the course suitable for both, classroom and distance learning.

Keywords: ESP course, engineering education, blended learning, motivation, language competence

INTRODUCTION

The issue of integrating information technologies into learning languages is likely to get more widely spread due to uncertainties of the modern world. It is difficult to predict even the nearest future and the conditions people will find themselves in. Therefore, it is prudent to develop electronic learning materials and environments at the institutional level. As a matter of fact, tailored materials often vary significantly even within one educational institution. They mostly depend on the level of IT proficiency of a certain language instructor.

Blended learning gained its popularity with the advent of computers and the Internet. It was a new tool that was warmly welcomed by most language instructors and students. Actually, technological advances have created the possibility of new ways of learning and teaching [1].

The relevance of digital technology is recognised by educational establishments all over the world. With the crucial role of digital systems in the modern society, an increasing number of universities incorporate Web technologies into their courses. The introduction of on-line learning environments into higher education is due to the study potential they offer for students, as well as the ability to bring positive changes in student study experience. However, the effectiveness of digital technologies depends on the degree to which they prompt students' engagement in constructive learning activities.

In order to enhance engineering students' acquisition of domain-specific knowledge in English in the present realms of uncertainty and distance learning, a novel virtual learning environment complementing traditional classroom learning is required. It should be flexible, allow for successful integration into the traditional onsite language classroom and should be used as the basic tool for organising distance learning. The present study utilises this up-to-date on-line model to demonstrate the feasibility of the system and its effectiveness within the context of engineering domains in higher education.

In this study, are considered differences in motivation and attitudes towards distance learning among male and female engineering students for the purpose of better planning and content selection for a blended ESP course. The educational attainment of future engineers has undergone some changes as the number of women in various fields of engineering; namely, the oil and gas industry has increased significantly compared to previous years. Gender sensitive awareness emphasises gender differences in the petroleum sphere and addresses the social and cultural factors involved in

the educational process of future engineers. The growing gender awareness is triggered by the process of exploring, questioning, identifying and understanding the role of women/men in engineering professions. Thus, creating a gender-friendly technical education course and guiding students to review their thoughts on gender roles in the professional sphere provide opportunities for professional self-actualisation [2] and self-awareness.

The aims of the study were to:

- 1) reveal the motivational potential of the supplementary digital component in an ESP course by assessing the satisfaction with distance learning of male and female engineering students;
- 2) prove the feasibility of the on-line EPS course;
- 3) assess and compare the academic productivity of experimental and control engineering students groups in the ESP course.

BACKGROUND

The means of fostering students' engagement in the on-line learning experience have become an essential topic of methodological research in the recent times. It requires some control over learning time, pace and delivery in technological environments. Modern education involves comprehensive information communications technology means. Yet many educators find it daunting to implement the alternative methods primarily alluding to technical barriers, logistical barriers (dissatisfaction with the distance learning modality), personal barriers (lack of technical expertise, training, support) [3]. Concurrently, there are multitudinous opportunities of on-line vocational courses for engineering students to choose from [4] that particularly focus on information technologies in learning and address contemporary language competencies required in view of professional goals in educational programmes [5].

In the present study, the intention is to highlight the advantages of technology-supported learning environments; namely, a blended ESP course. Blended learning aligns with compendious cognitive processing, higher perceived learning, convincing performance [6][7]. The trending concept of edutainment [8] and modelling contribute to affiliation, peer cohesion, involvement into the process and study enjoyment. Intrinsically, screen-based virtual simulation videos provide not only distance accessible virtual learning experience, but also prove that exposure to visual and aural elements in ESP clips encourage learners to widen career-related vocabulary, showing how paralinguistic elements are used in different contexts and cultures.

Current studies often focus on blended learning that combines both in-class learning with an integrated Web-based approach that provides not only flexibility and facilitates the effectiveness of educational process, but also enables independence and critical thinking [9] among engineering students. Previous research has demonstrated that this approach promotes active learning [10], deepens understanding, improves critical thinking skills and creative communication [11], as well as improves learners' cognitive processing [12]. The division between face-to-face and technologically mediated learning environments is becoming blurred and an e-learning tool offers streamlined and presumably effective practice activities [13].

As technical science implies continuous development, there is a need to introduce multimodal ESP domain-specific corpora with cross-cultural bilingual encoding and decoding of technical domain texts [14] to the educational process. Thus, the possibility of creating digital platforms for engineering students, including those from the mineral sector, is of vital importance and it should be inextricably linked to language learning and be in accordance with the on-line course curriculum. In that context, the importance of the development of professionally oriented selection of video-clips for technically inclined students could not be overestimated. This and similar developments *provide a proper response to rapidly changing conditions in modern society development* [15] as they have numerous distinctive traits, including a multimodal approach to the situated communicative context marked by domain-specific discursive, pragmatic and cultural features, and incidental and deliberate practicing. The increasing market demand for engineers who are able to exploit communication modes beyond the verbal language (gestural and visual) and master the target language in a most effective way bring to light new learning styles that immeasurably improve the communicative competence of future engineers.

Concomitant frequent exposures to English video clips enable non-intentional, yet deliberate learning process. Naturally video material has to be prepared in accordance with language teaching principles and be based on understanding the psychological notion of attention and retention. Moreover, it has to be supported with exercises and on-line tests. Viewing video-clips provides a rich learning experience akin to the immersion in representative, domain-specific examples, explicitly aiming at improving certain aspects of English for specific purposes. The project presented as part of this experiment has arisen in the context of a new educational trend that aims to stimulate a proactive role of the student.

METHODOLOGY

The traditional model of education is understood by the student-teacher-content triangle [16]. In the current study, based on the above literature review and theoretical assumptions, a pilot four-componential frame model of the content on the blended learning platform was proposed, and expected to affect students' performance and cognitive engagement into the study process. Relevant communicative professionally-oriented activities have been designed and developed primarily for engineering students. The aim was to improve non-native speakers' command of English, their communicative competence and motivation to advance in English.

Generation Z, the prevailing focus of this study, combines various features that need a thorough investigation in readiness for blended learning. Giving a closer look at these students, it can be stated that they are more technologically perceptive, require constructive assessment from a course instructor and may get easily anxious while performing the task [17]. Being entrepreneur-driven and goal-oriented, they need to be surrounded by a learning environment that will facilitate acquiring the language skill, so as to succeed in their professional sphere. Moreover, the goal of an ESP instructor is not only to introduce the blended learning environment, but also to *…harmoniously combine the technological and aesthetic components of professional activity* [18].

However, in this study, some discrepancy was observed regarding attitudes toward on-line learning between genders. The assumption was confirmed by a survey. The questionnaire included the following questions: 1) did you enjoy studying on-line more comparing to in-class ESP lessons?; 2) was the on-line course more effective during distance learning (caused by pandemic lockdowns in the whole world)? A total of 240 first- and second-year engineering students of Saint Petersburg Mining University in Russia were interviewed. Male students accounted for 70%, female - 30%. A total of 120 students answered *no* to both questions, including 84 male students and 36 female students. Thirty-three male students and ten female students responded *yes* to both questions.

The results of the survey show that 50% of the students were not keen on having on-line lessons only. They missed faceto-face communication, seeing friends in person. Most students found it hard to get themselves to start reading or doing anything and they kept on procrastinating. They experienced difficulties in doing everything alone as they were used to having pair work and teamwork. Moreover, some students had technical problems with the Internet connection, headphones and those of time zone difference. It is important to note that the percentage of male students dissatisfied with distance learning was higher by 12% than female students and reached 56%, while this figure for girls was 44%. Female students seemed to be more flexible and better capable of adapting to new conditions.

Only 18% said *yes* to both questions which means that they preferred distance learning to face-to-face learning. The reasons they mentioned included considerable time saving as they did not have to go to university, a slower pace of life, more comfortable and safe conditions as they could sleep longer, stay in and follow precautious measures. The greatest advantage turned out to be an opportunity to plan learning activities individually. Twenty-eight percent showed a mixed attitude claiming that there were both benefits and drawbacks in distance learning.

The survey showed that most engineering students despite their technical mind-set were willing to combine technically supported means of learning and in-person communication. Therefore, blended learning not only regains its popularity as a modern teaching tool, but also becomes a necessity in the realms of the global pandemic. For course developers the awareness of students' motivation is crucial to select appropriate content and types of tasks, which is why students' responses (Table 1) were analysed and taken into account in the blended course development.

Did you enjoy studying on-line more comparing to in-class ESP lessons?						
No (male students' responses, in order of priority)	No (female students' response, in order of priority)					
- No live contact with the teacher, little video lessons,	- Difficult to make myself work/lacked motivation					
communication through e-mails takes longer, some	and self-discipline;					
lecturers did not get in touch;	 Lack of communication with friends; 					
- Not enough practical tasks;	- More homework and self-study load.					
- Technical problems with communication responses;						
- Increased workload/more homework.						
Yes (male students' responses, in order of priority)	Yes (female students' response, in order of priority)					
- More free time/no need to spend time and money to	- More comfortable at home/comfortable pace of					
commute to university;	life;					
- More time for self-study/working at a comfortable pace;	- A more personalised approach;					
- Easier to understand the material given;	- A new study format that motivates more;					
- Comfortable conditions for non-resident students.	- Less stress and safer conditions.					
Was on-line course more effective during distance learning?						
No (male students' responses, in order of priority)	No (female students' response, in order of priority)					
- There are many distractions at home (affecting motivation	- Lack/absence of live communication in English					
and desire to learn);	(no face-to-face, no opportunity to discuss					
- The material was more difficult to understand (it is more	questions and assignments);					
difficult to study the material on your own);	- Few assignments (no additional assignments and					
- Time at the computer negatively affects the eyesight.	visual material on the theory, no audition);					
Yes (male students' responses, in order of priority)	Yes (female students' response, in order of priority)					
- More time for self-development and learning extra material;	- More effective learning with an experienced tutor;					
- Being in charge feels good;	- Can manage time more effectively;					
- Self-study is more efficient.	- Tutor is more available.					

Table 1: Gender-based survey on students' satisfaction with distance learning.

The frame model of a blended ESP course is aimed at finding a balance between face-to-face and distance learning to boost motivation and language acquisition. The virtual learning environment is based on four main components:

- 1) Modular ESP course comprising 12 units. The study is based on the assumption that domain communicative competence is achievable due to relevant authentic field material including texts, articles, reports and a set of exercises to master highly specialised engineering terms to provide professionally oriented communication in English and improve academic motivation which is a primary goal of engineering education [19]. Students acquire understanding of the technical domain in the target language through a set of subject-related assignments: pronunciation skills, lexical meaning drills, terms in collocations, as well as on the text level. Moreover, lecturers from the departments administering the relevant majors were involved to verify the used materials and make sure they comply with the materials taught in profile subjects.
- Video course: specifically designed for the Mining University English for Specific Purposes course, ten videos last a maximum of 10-12 minutes. Every clip is accompanied by subtitles (description of technological processes related to the chosen fields). Scripted and constructed dialogues were written to sound natural in general alignment with real-life situations in the professional sphere. Students may benefit from the use of clips for diverse reasons:
 a) it is an effective method to provide career immersion for technically-minded students; and b) clips offer a handson approach to the target language with a multimodal corpus providing relevant engineering knowledge.

The elaboration of the English video course was carried out in accordance with the basic didactic and methodological rules of pedagogical design. Tentatively, the design process was conducted in three stages: a) the target audience was determined; namely, petroleum engineering students and mineral processing engineering students; b) curriculum of the course was developed, implying a set of modules, covering all the content required to form communicative skills of future engineers; and c) content development progressed in accordance with the logical structure of the course and its expected educational outcomes.

- Audio course: a pilot audio course was introduced to enhance term acquisition through real-life situations in the professional sphere (interviews with specialists of petroleum engineering dwelling on technological advances of contemporary conditions in the sphere).
- 4) Final project: as Generation Z members prefer practical, real-world learning experiences [20], experimental groups were offered a final project that the students found relevant to their role in petroleum industry. They were offered to watch a documentary, so as to write a possible script describing the process of a certain situation in the field; namely, the largest accidental oil spill of 2010 in the Gulf of Mexico.

The main potential of the proposed teaching tool is a set of various overt learning activities that allow transferring and applying the acquired knowledge to new situations. Moreover, this virtual learning environment enables the testing of students' performance, as well as the promotion and support of directed learning strategies. There should be mentioned the importance of mobile-based applications that help implement authentic and up-to-date data, stimulating interest and increasing motivation.

RESULTS

To prove the feasibility of the developed model an experiment was set up. Eighty-seven petroleum, and mineral processing engineering students, 20-21 years old (56 males and 31 females) from Saint Petersburg Mining University in Russia participated in the experiment. There were four groups: two experimental and two control ones. The experiment covered the second year of study (4th semester) and introduced a cycle of six resource-based onsite classes with an expanded set of career-related tasks. All students initially had an intermediate level of English according to the Common European Framework of Reference for Languages (CEFR).

When the learners had accumulated theoretical knowledge in petroleum and mineral processing engineering, they were provided with resource-based classes in English. During a resource-based onsite class, students worked individually, in pairs and in small groups of five-six people. Learners were engaged in a variety of complex problem-solving activities coming from knowledge integration in the chosen field. Additionally, the experimental groups were asked to work in the virtual learning environment on their own.

To illustrate the impact of the virtual learning tool on students' productivity, an extensive assessment procedure was developed. It was made up of two parts. Part 1 included three tasks to:

- 1) match the words/phrases with their definition;
- 2) translate an ESP text;
- 3) name parts of the assembled equipment on the scheme.

These types of tasks were selected to make sure that the students 1) have a good command of technical terms; 2) have developed translation skills; 3) can describe industrial equipment. These skills are important for engineers who often have to work with technical texts in English and Russian.

Part 2 was based on a mute video demonstrating the process of completing a well. The task was to describe the process using adequate grammar and vocabulary. This type of task was chosen to exemplify a particular responsibility of engineers that is to present and explain technological solutions, new ideas using schemes, graphs, etc. This part is more difficult than the first one as it is the final stage of the PPP paradigm (presentation, practice, production) and implies a good command of both vocabulary and grammar, as well as other skills, such as note-taking, writing, transforming visuals into text. The majority of students later confirmed that the task was quite a challenge.

The constructive task was assessed according to the following criteria:

- 1) content compliance with the video sequence;
- 2) vocabulary accurate and complete rendition of meaning at word and phrase level;
- 3) grammar correct use of grammatical categories;
- 4) structure clarity and conciseness.

Both parts of the assessment procedure used the same scoring system, with the highest score being five. The total score was obtained by adding the scores received for the completed tasks in two parts of the assessment procedure. The average score of experimental and control groups is shown below providing clear evidence of the results. The average scores were decimals but for the purpose of this article they were rounded off. The results are given in Table 2.

Table 2: Comparative assessment of students' results and correlation between on-line course engagement and acquiring language skills in the ESP course.

	Final test score						Total	
Students Part 1 (career-related ESP tasks)		ted ESP	Part 2 (constructive ESP task)				score	
	Task 1	Task 2	Task 3	Content	Vocabulary	Grammar	Structure	
Average score of students of two experimental groups	5	5	5	5	5	5	5	35
Average score of students of two control groups	5	5	5	3	4	4	3	29

As can be seen that all students from the experimental and control groups fully succeeded in performing the tasks of part 1. They managed to do the matching task, translated the technical text successfully and identified parts of the equipment on the scheme. However, part 2 turned out to be much more difficult for the control groups. The results show that knowing the terms does not guarantee their confident usage in productive language activity. The students of the control groups struggled to multitask and keep balance between grammar and vocabulary accuracy, logical narration and the use of adequate discourse markers. It proves that the additional on-line course can be effective and instrumental in developing productive skills.

The developed blended course made it possible to provide good opportunities for effective individual work. As all students have their own learning strategies and pace of language acquisition, at some stage and with some tasks they may seem less involved and productive in face-to-face lessons. Hence, on-line learning can be beneficial for students, providing an opportunity to stop and think, reflect on the place in ESP they have or have not reached. The obtained results suggest that blended learning can be efficient in an ESP course in terms of boosting motivation and productive skills development.

CONCLUSIONS

Based on the experiment and the survey results, the following conclusions can be drawn:

- 1) students prefer a combination of face-to-face and distance learning as it gives them a certain degree of flexibility: they can study at their own pace, concentrate on most important issues, feel in charge of their performance;
- 2) properly designed blended course turns out to be more effective than traditional language classes due to stronger motivational component, diverse materials and digital part which is favoured by Generation Z;
- 3) gender-based motivation and satisfaction surveys are worth conducting in order to better understand the needs and attitudes of students which is essential for the design a tailored blended course;
- 4) blended learning should be given a closer look and reconsidered given the modern realms of uncertainty as it proves to be an effective tool to improve academic performance;
- 5) blended learning has a vast potential for tightening interdisciplinary links between ESP and professional subjects, and therefore for further improvement of academic performance.

It has to be stressed that only flexible, independent and psychologically mature students can enjoy all the benefits of distance learning resulting in great academic performance. However, as their proportion is relatively low (the present study revealed only 18%), a blended learning course could be an excellent opportunity for all students to make the most of the course in the pandemic times. On the one hand, it allows students to develop their own learning strategies, improve time-management skill as they spend some time learning on their own. On the other hand, the close link between members of

the group does not get lost, given that face-to-face communication is still crucial for young people. A blended learning course offers a variable content that is likely to suit both male and female students. Moreover, it suggests a compromise between using conventional and innovative methods.

It may be pondered that the methodological design of the course contributed significantly to the teaching process with video clips being a crucial variable for student engagement. One can consider that this set of a four-step scaffolding model can be adapted in future research to fill in previously mentioned gaps concerning the implementation of English medium courses.

The present model structure of the blended learning platform is an effective supplementary method to provide career immersion for technically-minded students. The digital learning environment has the potential to be integrated into ESP courses of technical universities and should be given a closer attention. However, the proposed digital support design should be accomplished in a close collaboration with content instructors, thus intensifying students' engagement into the course. Therefore, future studies should be carried out in close co-operation with lecturers of major courses. Admittedly, this would create a more relevant data-centred, authentic course, *as well as contribute to more deliberate and effective use of technology beyond the classroom setting* [21].

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