English for specific purposes (ESP) on-line teaching for engineering students

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ABSTRACT: On-line English for specific purposes (ESP) language learning is evolving with digital tools creating a learning environment varied in opportunities. This study reports on an adaptive model that induces a better acquisition of ESP course content through e-learning. The study involves two strands. First, it presents meta-analysis of students' achievements in on-line learning; and second, it provides an algorithm to enhance the ESP level for students of a technical university. The aim of this article is to present the analysis of the effectiveness of this model. The model has been tested for its influence on the effectiveness of ESP e-learning, and the potential of the model has been assessed. The findings indicate that student motivation and the completion of teacher-led, time-limited but engaging assignments are essential to ESP students' success.

INTRODUCTION

Factors affecting academic achievement receive meticulous attention. The English for Specific Purposes (ESP) course provided for engineering students is the subject of this research. The year 2020-2021 has seen an irreversible change in education due to the unprecedented adoption of on-line learning during the lockdown caused by the coronavirus pandemic. The widespread availability of digital technologies and the development of analytical systems facilitates novel approaches to technical and vocational training. Educational institutions are searching for the best approach to e-learning.

The ultimate goal of the research reported here is to assist engineering students to self-regulate their English learning. This should be realised without losing engagement in the educational process, otherwise the undergraduates will be reluctant to boost their level of English over the long-term.

The development of these new technologies implies the need for a substantial reorientation of the vocational education system. Innovative possibilities are driven by social networking, crowdsourcing, platforms with integrated artificial intelligence and cloud services. A technology-oriented digital environment can transform the professional competencies of students.

An e-learning environment expands opportunities for students to pursue multiple learning pathways, which could foster language improvements. The use of digital and reflective technologies are the key criteria in a new methodological paradigm. The distinct feature of the e-environment is the access to abundant worldwide learning resources. However, on-line learning is still considered to not concentrate knowledge and suffers from poor feedback.

The article builds on earlier initial findings by describing an adaptive model and its implementation in greater detail. Specifically, it explores a Web-based self-learning, though teacher-led, on-line ESP course. The research hypothesis is that a distance-learning ESP course would be efficient if:

1. students are motivated to pursue an ESP course in an e-learning environment;
2. a translation assignment is adapted to distanced learning.

This study deals with a model to boost ESP translation skills among future petroleum engineers.

LITERATURE REVIEW

Students in on-line learning should be metacognitively and motivationally active in their self-learning. They should advance through three phases: a preparatory phase, a performance phase and an appraisal phase [1].

Sekhavat opines that the concept of competition is pivotal in on-line games [2]. This was incorporated into the present research, as the desired behaviour of students without constant teacher supervision requires active learning. The objective is to find a model of e-learning, where students independently analyse, explore, practice, translate and question the subject under consideration. While not every person is ready to demonstrate autonomous and conscious study behaviour, the method offered would enable tutors to find this *golden fruit* to quality education via on-line learning.

Ari at al suggest a structural equation model with several factors that extensively influence an undergraduate during on-line educational gaming: visual appeal, escape from reality, flow experience, success, enjoyment, self-efficacy, intention of playing [3]. Some of these factors may be implemented in on-line teaching engaging future engineers in a learning process notwithstanding the fact that students are continually stressed due to worldwide conditions.

Wang raises the question of a composition structure for an on-line lesson [4]. It is not possible to stick to conventional lesson arrangements while providing ESP on-line. It has to be adapted to a new-fangled realm of life. However, studies on curriculum design are insufficient.

There are some recent studies devoted to vocational curricula, dwelling on design principles for a specific type of learning environment [5], higher education curricula [6], professional expertise development [7], vocational curricula comprised of a combination of school-based learning and workplace learning [8], enhancing students' inter-professional learning [9], patterns of network learning and educational design [10], a professionally-oriented language course [11].

An additional challenge is to include technical translation into distance learning. The significance of interpretation skills among technically minded students cannot be overestimated. Knowledge content in foreign languages means there is a need to improve language competencies. Introducing translation-based assignments requires focusing on translation techniques that present a particular hindrance not only for students but for teachers as well. It is essential to provide an explicit instruction on how to select an opportune translation technique and ESP texts.

It is currently an open-ended question as to what to include into a translation module given the time allocated to a language course and the disincentive of independent learning [12]. There are computer-aided translation programs [13] that facilitate the task for students who are not strongly motivated to perform tasks without direct in-class supervision of an ESP instructor. While machine translation has advanced tremendously, they still provide low quality translation.

The versatility and non-linearity of new generation mentality triggers ESP instructors to search for new ways of organising engineering and vocational education. The predominant feature of a new system is co-operation. One of the ways to mobilise English acquisition on-line is by networked learning. Jackson expounds a model of networking, where individuals from different schools get together to engage in rigorous joint work activity [14].

The model has been applied in a modified way as collaborative learning in a network of students acquiring diverse technical qualifications requiring communicative and translation skills [15].

Another issue is the discrepancy in motivation to improve the language level between male and female students. Sishchuk et al in their article entitled *Gender effect in postgraduate studies at higher technical institutions in Russia, Austria and the UK* state that *…women mainly are engaged in humanities research, while men do research in engineering* [16], thus, the ESP instructor has to approach male and female students differently.

METHODOLOGY AND RESULTS

This research was focused on students at a technical university enrolled in an ESP course. Respondents to the study were second-year petroleum engineering students from the Bachelor programme with an intermediate language level according to the common European framework of reference for languages (CEFR). The age distribution was between 19 and 21 years.

A case study was employed in the survey. The participants were compelled to change the form of study to on-line learning. They were obliged to use Internet-enabled media and various networking tools, such as an e-ESP course on Instagram, launched by the author in 2020 [17].

There are obvious advantages of social media in a lockdown as they support distributed access to content and communications. The author elaborated a detailed course focused on access to career-related information linked to real-life situations for future petroleum engineers.

The model to boost ESP has two different modes:

- Synchronous mode: students and an ESP instructor are geographically separated, but have a prearranged time for an on-line-class. The ESP course with integrated translation assignments, discussions and presentations take place at the indicated hour in a virtual classroom (e.g. Cisco Webex);

- Asynchronous mode: students perform various assignments on-line that can be accessed by a student at any time, and learning is self-regulated (e.g. Google classroom, quizlet, on-line test pad).

The current study enabled the determination of the most effective e-ESP model by applying the following formula (Formula 1):

Formula 1: Equation to determine the most effective way to boost ESP learning in distance learning.

$$(A_1* k_1 + A_2* k_2+ A_3* k_3+ A_4* k_4+ A_5* k_5) *k_2 + (B_1* k_1 + B_2* k_2 + B_3* k_3 + B_4* k_4 + B_5* k_5) *k_2 + (C_1* k_1 + C_2* k_2 + C_3* k_3 + C_4* k_4 + C_5* k_5) *k_2 + (D_1* k_1 + D_2* k_2 + D_3* k_3 + D_4* k_4 + D_5* k_5) *k_2 +(E_1* k_1 + E_2* k_2 + E_3* k_3 + E_4* k_4 + E_5* k_5) *k_{2,} +(F_1* k_1 + F_2* k_2 + F_3* k_3 + F_4* k_4 + F_5* k_5) *k_{2,} +(G_1* k_1 + G_2* k_2 + G_3* k_3 + G_4* k_4 + G_5* k_5) *k_{2,} +(H_1* k_1 + H_2* k_2 + H_3* k_3 + H_4* k_4 + H_5* k_5) *k_{2,}$$

Where:

A - assessment ratio of on-line tests completed as homework;
B - assessment ratio of translations completed during the teacher-supervised lesson;
C - assessment ratio of extensive reading and translation assignment;
D - assessment ratio of self-directed reading assignment with informative translation;
E - assessment ratio of a career-related text presentation;
F - assessment ratio of ESP gist translation;
G - assessment ratio of essay writing;
H - assessment ratio of grammar tasks completed during the lesson;
k_1 - time spent on the task to the entire time until the next class ratio;
k_2 - number of tasks completed on time, frequency of completion and attendance of on-line classes.

The first characteristic of academic achievement are the assignments within an ESP course:

- translations completed during the teacher-supervised lessons;
- on-line tests completed as homework;
- extensive reading and translation of technically oriented texts;
- a presentation of career-related texts;
- self-directed reading assignments with informative translation.

The second characteristic is the time spent on completing tasks:

- the number of tasks completed on time;
- frequency of completion;
- attendance at on-line classes on time and frequency of completion.

The off-line format does not allow for this. By comparison, an instructor has an advantage of personal conversation and getting students accustomed to a new learning environment.

The formula allows a student to study and practice regularly, i.e. to employ technical English and advance continually. Depending on the performance appraisal system of the university and the initial language level of students, the teacher can moderate the received grades with the grading system of a particular university.

The effect on academic achievements of ESP students revealed by the model may be summarised:

- self-efficacy, task value and goal orientation are primary factors to motivate students to perform tasks;
- students with task motivation (low k_1 and increased k_2) engage in ESP course assignments more frequently;
- the importance of task motivation with explanation provided by an ESP instructor;
- on-line assignments should be devised in such a way so as to encourage students to focus on the activity.

DISCUSSION

The model analysed diverse variants to identify efficient on-line studying. The model simulates the first academic semester of an ESP course, September to December. The total number of tasks performed within four months is 53 covered both autonomously and through a teacher-led lessons. The assignments were scheduled throughout the semester (Table 1).

During the predetermined period, an experimental group completed the tasks in a computer-based learning environment (see Figure 1). The highest possible score of all the assignments was 921, with $k_2 = 1$, if all tasks of the course are

completed on time. The grading system is a 5-point scale. Consider A equalling 5 points, B - 4 points, C - 3 points, F - 2 points. The lowest possible score is 219 with $k_2 = 1$. However, it should be noted that it might be achieved through an on-time performance and a positive evaluation of C and B grades.

Table 1: Scheduled workload of an ESP course for a semester.

Scheduled workload	Tests being completed as homework	Translations completed during the teacher-supervised lesson	Extensive reading and translation assignment	Self-directed reading assignment with informative translation	A career-related text presentation	Essay writing	ESP gist translation	Grammar tasks completed during the lesson
02 Sep.				1				1
09 Sep.	1			1				1
16 Sep.	1	1		1				1
23 Sep.	1			1				1
30 Sep.	1			1		1		
07 Oct.	1	1		1				1
14 Oct.			1			1		
21 Oct.	1			1		1		1
28 Oct.	1	1		1				1
04 Nov.	1			1				1
11 Nov.	1			1				1
18 Nov.	1	1		1				
25 Nov.			1			1		
02 Dec.	1			1		1		1
09.Dec.	1	1		1				1
16 Dec.	1			1				1
23 Dec.		1			1			

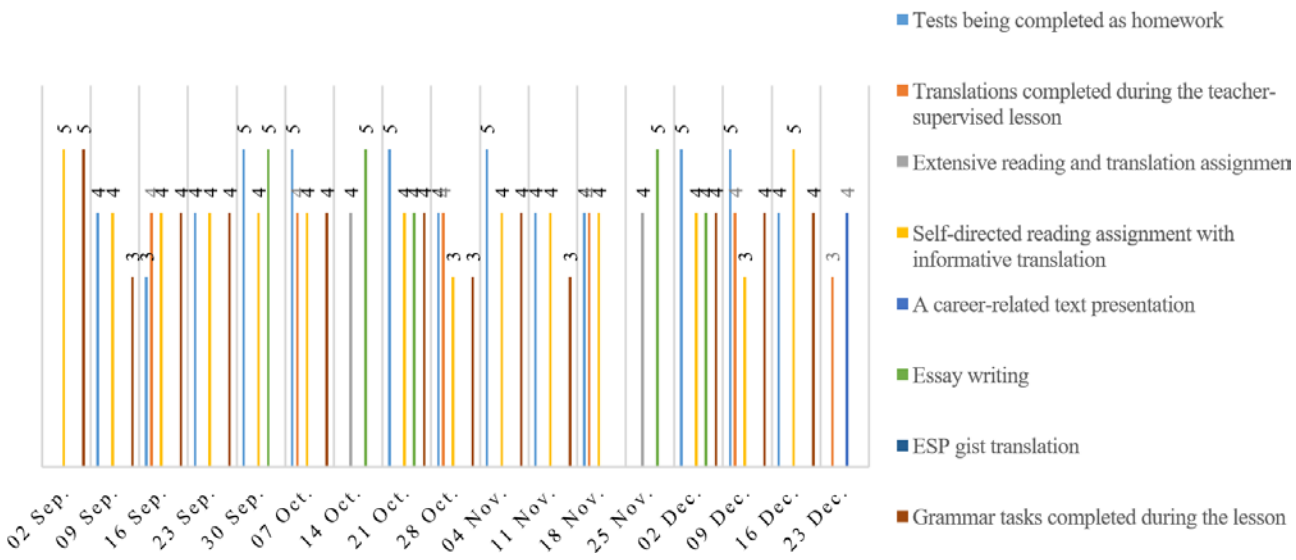

Figure 1: Results of the e-ESP course.

Essentially, the model motivates students to keep up with the pace of the curriculum with A and B grades. A deadline of 2 weeks lowers the total score to 23 (calculated according to Formula 1), which is considered a failing grade.

The calculation of the average score presupposes a student completed all the tasks on time except for 2-day assignments. Thus, nine tasks did not meet the deadline. The average performance grades are A and B. Figure 1 presents the final outcome of the average score for the predetermined assignments accomplished by the experimental group of second-year ESP students.

The analysis was of career-related assignments in an on-line course restricted by time, and in a computer-based learning environment. This better reflects the need of a younger generation and inspires students to acquire technical translation skills and motivate the transition from permanent teacher supervision to self-study.

CONCLUSIONS AND RECOMMENDATIONS

ESP educational programmes are undergoing major changes due to new requirements. This study, has reported on an adaptive model that will assist ESP instructors to boost language learning and technical translation of engineering and vocational students. The main objective was to explore the most efficient means and conduct meta-analyses of an adaptive model of ESP. All participants in the study successfully completed the EPS course. The verification of the research included a set of vocational assignments with integrated technical translation tasks. The outcome indicated that the e-learning environment improved the language competence of the participants.

The potential of the model has been under study by the author for some time. The study indicated that to improve and maintain a sustainable pace of language learning and acquiring translation skills on-line, students have to complete time-limited assignments, implementing the vocabulary learnt in lessons. The participants actively perform during a teacher-led on-line class, as well as the on-line testing given as a home assignment. The timing of their learning is considered in assessment. Qualitative data revealed that the slow pace of some of the participants is driven by the initial slow-pace in acquiring skills.

The main actor of this model should be an ESP instructor modifying the assignments and the scoring. Every ESP teacher may adapt the model to the requirements of a particular curriculum.

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