

The effectiveness of MOOCs in ESP for technical students: A Kazakhstan case study

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Abstract

This study looks at the critical problem of how to use Massive Open Online Courses (MOOCs) at the Republic of Kazakhstan's technical universities. Its objective is to study how professional-oriented foreign languages can be taught as MOOCs. As a methodological basis, it uses system-activity and competence approaches. The theoretical side includes the analysis and generalization of foreign and local scientific works to determine the advantages and disadvantages of MOOCs in the development of professional foreign language skills for students with technical specialties. Data on the use of MOOCs was analyzed and summarized at Karaganda Technical University. The quantitative results of the experiment were obtained using mathematical statistics. The authors ran a comparative analysis of the results between groups with traditional and mixed teaching methods in the English for Special Purposes course. A mixed method with MOOC technology integrated delivers better results than traditional education. Empirical results demonstrate that this method improves communication skills in the main areas of speech activity, professional vocabulary expansion, and theoretical knowledge enrichment of students within their specialty. The results indicate that using MOOCs as part of the ESP course leads to better educational results in comparison to traditional education. The use of system-activity and communicative approaches unlocked new opportunities for students, like increasing English proficiency levels, developing critical thinking and time-management skills, solving problems, and advancing their knowledge of their discipline. The authors studied MOOCs in a small data environment using an alternative qualitative research analysis method and came to the conclusion that MOOCs are effective in ESP courses for engineering students.

Key words: innovative information technology, Massive Open Online Courses (MOOC), professional-oriented foreign language, blended learning methods, National Open Education Platform, Small Private Online Course (SPOC), English for Special Purposes (ESP)

Introduction

The advent of the information society and radical technological changes, including ubiquitous high-speed internet, make the interaction between education, science, and industry closer and the opportunities for open access of students to the global network more expansive (United Nations, 2021). Contemporary young people are proving their competitiveness in the global information society using information technology, actively responding to trends in computer information technology (Ubaeva, 2018).

The process of societal informatization accelerates and expands the opportunities presented by distance learning technology as an economically beneficial solution to the problems associated with teaching students at technical universities and provides a real transition to the principle of lifelong learning where literacy and numeracy are the core of basic education and indispensable for full participation in society (Hanemann, 2015). Obviously, informatization processes contribute to the improvement and modernization of education and science (Negrut et al., 2010). One of the main and most attractive characteristics of innovative information technology is an opportunity

for each student at technical universities to build the educational model and path that best suit their professional abilities and ideas (Laurillard, 2013: 156).

According to Digital Strategy USA to 2024, digital technologies are a driving force for development, the main strategic force of which is the creation and maintenance of open and secure digital ecosystems (Digital Strategy USA, 2020, p.25). Achieving that goal requires a multifaceted and system-oriented approach. The paper shows the possibilities of using digital technologies to achieve sustainable growth for the global digital ecosystem.

In Kazakhstan, digital technologies are relevant to all areas of society, and the educational sphere is no exception (Mynbayeva & Anarbek, 2016). Globalization processes worldwide have strengthened the leading role of the English language in modern civilization (Mishota, 2013).

The status of English became official in several modern states, the history of which is associated with Britain (Crystal, 1997, p. 53). Professor V. D. Arakin points out that by the beginning of the twenty-first century, English had become a second native language for many people, which may indicate its global status (Arakin, 2001, p.42). Kazakhstan also saw the English language become the lingua franca for new technologies, new industries, and a new economy (Zhetessova et al., 2019). Without mastering the English language, Kazakhstan will not achieve national progress (Message of the President of the Republic of Kazakhstan, 2018).

Massive Open Access Courses (MOOCs) in education are a modern technology used to organize blended learning with interactive user participation and the use of learning technologies via the Internet (Sidek et al., 2020, p.589). They have gained great popularity, are rapidly developing, reach an increasing audience, and also implement modern pedagogical concepts. The study of the applied benefit of MOOCs is relevant in the context of teaching a foreign language at non-linguistic faculties of technical universities.

The scientific literature mainly deals with the issues of teaching foreign languages with MOOC. However, there is limited data on MOOCs as a tool for ESP in the context of technical specialties—in our case, metallurgy. This article aims to establish the effectiveness of using MOOCs to teach ESP at a technical university.

Literature review

Lackner, Kopp, and Ebner (2014, p.215) consider MOOCs a trending phenomenon in e-learning. In their opinion, neither distance learning nor online courses are new, though MOOCs hold great potential, especially in the field of education, which has attracted public attention (Lackner, Kopp, & Ebner, 2014, p.215).

Scientists from Latin America revealed that MOOCs were the most researched e-learning modality (Berrocoso et al., 2020, p.51). The future of e-learning must be built on openness and equality with an education in digital competence. MOOCs evolved from previous experiences in open education and e-learning. Their background includes the movement toward open educational resources and pioneering initiatives in distance education with digital technology (Berrocoso et al., 2020, p.51).

Kang (2019) showed that MOOCs involve a wide range of learning groups, while SPOCs and their specific requirements for a particular ESP level are for small groups. A combination of MOOCs and SPOCs contributes to the development and innovation in teaching professional foreign languages (Kang, 2019).

According to Datsun (2019, p.162), student motivation and satisfaction with the educational process were increased by SPOCs in European universities. The author also accents that SPOCs, as opposed to MOOCs, are used for less motivated students. Wailji, Deacon, Small, and Czerniewicz (2016, p.208) claimed that MOOCs occupy an intermediate space between traditional formal courses and online textbooks, providing an opportunity for numerous people to participate in various forms of social interaction. They also look at how student engagement in MOOCs can be organized

using three pedagogical dimensions: teacher presence, social learning, and peer learning (Wailji et al., 2016).

Barak, Watteda, and Haik (2016, p.46) highlighted the following features: MOOC participants' similar goals regardless of the language of instruction, intrinsic motivation and self-determination, and interaction in large and small groups while studying a professional foreign language.

The scholar Liu (2016, p.280) claims that the traditional model for teaching professional foreign languages dominates. The author proposes to use the new model for teaching English, teaching professional foreign language courses in conjunction with MOOCs and a flipped classroom. The point is that students, independently or together, spend time prior to lessons studying the basic concepts associated with the new topic using electronic teaching materials prepared by the teacher, while in-class time is used to apply new knowledge. The teacher has a special role as the organizer of the learning process, there to transfer knowledge to cognitive research activity (Lui, 2016: 280).

Grishkun (2018: 247) considers the organizational and pedagogical characteristics of local open educational resources and massive open distance (online) courses to substantiate their priority status in the development of modern native education. In his opinion, MOOCs increase independent student motivation to acquire the digital skills necessary for professional activity as well as the widespread distribution of rich collections of lectures, educational and test assignments, and excellent computer demonstrations of the material being studied, inevitably leading to a new educational paradigm that maximizes the use of information and distance technologies to create a single global information and educational environment (Grishkun, 2018: 270).

According to Fontana and Leffa (2018), the expanding supply of MOOCs demands a more in-depth study of their dynamics, pedagogy, and structure to evaluate their effectiveness as a tool for teaching foreign languages. The scholars analyzed two MOOCs covering separate foreign languages. After analyzing the results, they recommend using more specific criteria to determine the creative ability of students to perform tasks.

Indian scholar Thamarana (2016) stresses the role of MOOCs in foreign language learning, where he observes the audience as a huge virtual classroom. Improving speech activities like writing and listening, expanding vocabulary, and communicating with peers from all over the world make MOOCs an attractive and innovative technology in Indian higher education.

Lawrence (2015: 21) considers teaching professional foreign languages at Asian universities in conjunction with specialists in technical disciplines for better teaching and course assessment. According to the author, MOOCs have clear advantages over traditional courses in specific disciplines. ESPMOOCs increase the need for English teachers to support students in their learning.

Lui (2016: 317) points out that implementing ESP training is difficult for many reasons. To begin with, he suggests creating a dedicated ESP teaching team. Teachers must be competent and capable of transferring academic knowledge, explaining academic terms, and analyzing practical cases in English. First, the author recommends increasing the level of the basic foreign language since it is only at that point that students can master the ESP discipline. ESPMOOCs are a real way to meet student needs for professional foreign languages (Lui, 2016: 317).

A number of scientific works by Stognieva (2017: 72; 2015: 63; 2019: 437) are devoted to a comprehensive study of teaching professionally oriented foreign language courses.

The researcher concludes that including foreign-language MOOCs in ESP curricula leads to improved mastery of material as compared to traditional teaching.

E.A. Kogan refers to the main indicators of English language acquisition by technical students as understanding complex texts, reading, listening comprehension, and the ability to retell the text, share impressions, and write reviews and scientific articles (Kogan, 2020, p.215).

The results of the study prove that including courses in a university's, ESP course works for the complex study of professional disciplines and the English language.

According to Deryugina (2015, p.624), the use of MOOCs on the Coursera platform for teaching professional English can significantly increase the motivation of students to learn. In her opinion, MOOCs are a future-oriented technology and a powerful tool for optimizing and improving professional training for future engineers.

The scientific literature thus mainly deals with teaching MOOCs in the foreign language discipline. However, there is not enough data on teaching a professional-oriented foreign language using MOOCs for technical fields. In this regard, the purpose of the article was to study the effectiveness of MOOCs in a professionally oriented foreign language course at a technical university.

In Kazakhstan, knowledge of foreign languages, especially English, expands the horizons of future Kazakh professionals; adds facets to their development; unlocks intellectual, professional, and career growth; and drives tolerance and a more inclusive vision of the world (Jantassova, 2015, p.136). In 2016, the National Platform for Open Education of Kazakhstan was established with that in mind by the leading universities of Kazakhstan, each university developing and hosting its own MOOCs (Kavashev, 2018, p.8). The platform is designed to create and promote accessible open learning as an innovative approach to education that involves students in work, creates positive multilevel learning, and develops student autonomy and research activities (Tulenbaev et al., 2019). The National Platform for Open Education of Kazakhstan was also considered a vehicle for a competence-based approach. In other words, according to a number of Kazakh researchers (Zhetessova et al., 2019), future graduates could distinguish empathy as well as team-building, critical thinking, communication, and other soft skills. The role of a university ESP teacher also shifted to facilitating activities as diverse as giving interviews and presentations, writing technical reports, following oral directions to complete a task, labeling diagrams/charts, writing technical documentation, writing blog entries, and filming videos to develop professional linguistic competence (Rus, 2020, p.337).

Research questions

After analyzing theoretical and practical research, we chose three research questions to address in this article:

RQ1: How does the effectiveness of MOOCs in professional foreign language classes for Kazakh students manifest itself?

RQ2: How do researchers measure the effectiveness of MOOC learning in English classes?

RQ3: Can we examine MOOC learning in a small data environment using an alternative qualitative research analysis method?

Scientific novelty

The scientific novelty of the study is to investigate the impact of MOOC learning on ESPs for engineering students and conduct an alternative qualitative research analysis with similar research questions.

Research methods

We used mixed research methodology with quantitative and qualitative data sources. This method of data collection is superior because it provides access to collective discursive practices with a high degree of emotional spontaneity.

Three different tools — pre- and post-placement testing, a structured questionnaire, and a semi-structured interview protocol with open-ended questions and subsequent discussion of the findings with the interlocutor — were applied. The questions for the questionnaires and interviews were analyzed using SPSS 17.0. The data was analyzed using statistical tests such as descriptive statistics, multiple response item analysis, and reliability analysis. The participants' English level was tested at the beginning of the MOOC and after completion with the help of the British Council English Score. It was chosen because it is aimed at the A1-C1 levels of the Common European Framework of Reference for Languages (CEFR) and tests listening, speaking, writing, and reading (Birajdar, 2020, p.7).

We chose the course among a range of MOOCs for students with lower intermediate or intermediate English proficiency looking to reach an upper intermediate level and followed criteria such as:

- Affiliation of the course developers to the English-speaking country
- English-language instruction
- Correspondence of the course content to the ESP curriculum
- Peer-reviewed project or essay as the final exam
- Certificate availability upon completion

The table below shows that the MOOC we found meets the above criteria and does not contradict the curriculum (Table 1).

Table 1. The MOOC for experimental training

Course title	Platform	Duration, weeks	Developer	English level	Video Transcript	Pre Requirements	Final attestation form	Certification
Materials Science: 10 Things Every Engineer should Know	Coursera	5	University of California	Intermediate	English	None	Students completing all the tasks offered by the course content	Course certificate

The course on Coursera, Materials Science: 10 Things Every Engineer Should Know by the University of California, USA, was devoted to the mechanical and electrical properties crucial to materials' use in various engineering fields. The duration was five weeks.

The ESP teachers were supposed to become facilitators, developing connectivism, communication, and critical thinking skills in future engineers (Sadiqa, 2020, p.196).

The study participants were 30 second-year engineering students at Karaganda Technical University who volunteered and were tested to identify their initial and final levels of English language proficiency. Two groups — experimental (EG) and control (CG) — were formed. Students in the EG studied ESP during the COVID-19 quarantine in Kazakhstan with the use of the Coursera MOOC, while the students in the CG studied without it. All other conditions were the same: the number of ESP hours at the university, the pre-course English level, and the workbook, which was English for Students of Metallurgy by M.S. Alekhina.

Research results

According to the ESP curriculum, Kazakh metallurgical students learn English from English for Metallurgical Students by M.S. Alekhina, which is identified as the basic textbook (Sillabus, 2020). The book was published in 2000 and includes material on the history of metallurgy, metallurgical processes, and country studies as well as oral topics and elements of business English (Alekhina, 2000). The book lacks authentic materials critical to the student-centered approach, given their function as a bridge between learning needs and vocabulary learning strategies (Sandagsuren & Emerson, 2015: 178).

Another challenge is that Kazakh metallurgy students study a total of 65 hours of English for Metallurgy (45 hours as seminars, 15 hours as individual student work with a teacher [IWST], and five hours as exams), while it takes 180-260 hours to move from B1 to B2 (Knight, 2018, p.10).

Table 2 – Independent two-sample t-test data before the experiment

Name	Mean_1	Mean_2	U	p_value	result_condition
Pre-test	2.647±0.571	2.553±0.675	0.409	0.686	The difference on the pre-test scale between the EG and the CG is not significant

Analysis of the first table of initial results for the experimental and control groups taken before going through the course and the professional foreign language MOOC shows that differences in English language proficiency are insignificant.

The experiment lasted 15 weeks. At the end of each week, the EG students sent screenshots to confirm their intermediary progress in the course, and the teachers translated that progress into academic grades. An independent two-sample t-test compared the mean differences in British Council English Score pre- and post-test results between the groups split into two independent variables: with and without the MOOC (Table 3).

Table 3 – Independent two-sample t-test data after the experiment

Name	Mean_1	Mean_2	U	p_value	result_condition
Post-test	2.605±0.397	3.187±0.441	-3.08	0.008	The difference in the post-test scale between the EG and the CG is significant

After participating in a 15-week course with the professional foreign language MOOC, the author found significant changes in English language proficiency between the experimental group and the control group.

A paired sample t-test showed the significant differences between pre-test and post-test data in the EG (Table 4).

Table 4 – Paired samples t-test data in EG and CG after the experiment

Na me	Mean_1	Mean_2	U	p_v alue	result_condition
EG	2.553±0.675	3.187±0.441	-3.432	0.004	Significant differences were found between pre-test and post-test in the EG.
CG	2.647±0.571	2.605±0.397	0.189	0.853	The differences between the pre-test and the post-test in the CG are not significant.

After identifying significant changes in course mastery for students in the experimental group, the one using the help of the professional foreign language MOOC, and the lack of change in the control group, the author attempted to identify the motivation of students in engineering specialties.

To measure the motivation of the engineering students to learn English, we gave them a questionnaire aimed at analyzing ESP student needs (Basturkmen, 2013). It included the following questions:

- 1) Do you agree that you improved your professional foreign language skills during the course?
- 2) Do you agree that MOOCs are innovative technologies that allow students to improve their foreign language professional knowledge and skills independently? Justify your answer.
- 3) Do you agree that integrating an online component (MOOC course) into the professional foreign language program is necessary?
- 4) Do you agree that getting a MOOC course certificate will help you in your job search?

As they answered the questions, the students assessed their agreement or disagreement with each statement on the Likert scale (<https://www.surveymonkey.com/mp/likert-scale/>):

- Absolutely agree
- Agree
- Neutral
- Disagree
- Completely disagree

Below is a diagram reflecting student opinions regarding their level of motivation to take an online course. Student answers are graphically presented in Diagram 1. Their answers were divided into four scales (questions): Bar1, Bar2, Bar3, and Bar4.

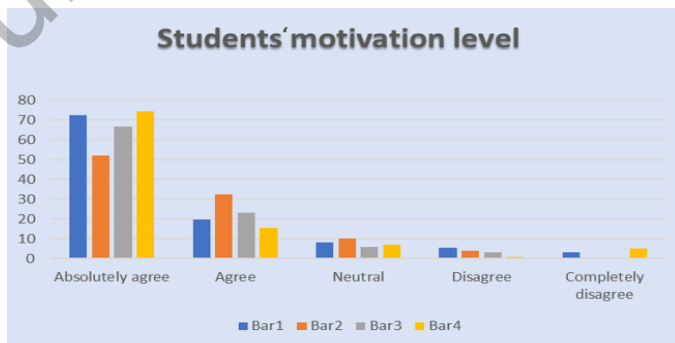


Diagram 1. Student motivation in the professional foreign language discipline within the MOOC framework

The majority of Kazakh students (71%) answered “Absolutely agree” to the assertion that their professional skills improved during the professional foreign language course. That indicates that most second-year students at Karaganda Technical University who have used innovative MOOC technologies are absolutely sure they have become better at understanding complex texts, reading foreign literature, understanding speech, and being able to retell text, share impressions, and write reviews. The second group of students (20%) agreed that their professional skills improved while learning a foreign language through the MOOC. In other words, 91% of students gave a positive assessment of their professional skills in learning and mastering a foreign language, corresponding to 27 learners out of 30.

The second question was related to the definition of the MOOC, which was presented as innovative technology allowing students to independently improve their professional knowledge and foreign language skills. In response to this question, 84% of Kazakh students answered “Completely agree” or “Agree” with the statement. Many (25 students) backed up their responses with points like accessibility, the ability to work on the internet with open sources, and the availability of schedules and deadlines, which discipline learners.

Ten percent of students (three people) were neutral about working with the MOOC model, explaining that by saying that distance learning can be a course in the higher education system, though universities should predominantly offer full-time studies.

The need to integrate an online component (MOOC) into the curriculum of the professional foreign language discipline was approved by 89% of second-year students at Karaganda Technical University, corresponding to 26 people. Only two were against participating in distance learning courses, potentially due to the difficulty of time management at home, technical problems and internet disruptions, or a high level of English.

Most students (89%) agreed that a certificate of completion for the MOOC will help them find a job. Two (6%) noted that getting a certificate can be an advantage when applying for a job but does not guarantee getting hired (their answer was “Neutral”). Two people with a good command of the language noted that the certificate will not affect employment, given that professional knowledge, skills, and abilities are more important.

The most popular answer among second-year students at Karaganda Technical University was “Absolutely agree” (65%, 20 people).

As we can see from the diagram, the results of the questionnaire showed increased motivation among engineering students with regard to the professional foreign language discipline.

From questions for which the most popular answer was “Absolutely agree,” it is clear that most students favored integrating MOOCs into the learning process.

In comparison, the least ubiquitous answer, “Completely disagree” (two students), tells us we can assume the answers were from students with a high language level. That indicates that second-year students at Karaganda Technical University need additional foreign language classes and, in particular, MOOCs.

Discussion

Analyzing the findings necessitates an overview of the research on student feedback after taking a MOOC course. A study by Noura Alhazzani, a professor at King Saud

University in Riyadh, explored the impact of MOOCs on higher education in the Kingdom of Saudi Arabia. Forty-eight King Saud University faculty members who were not previously familiar with MOOCs participated in the study. It was questionnaire-based, with the face and content validity of the questionnaire assessed. Responses were graded on a five-point Likert scale. As a result, the author concludes that 65% of teachers believe that MOOCs have a direct impact on higher education by improving educational outcomes (Alhazzani, 2020: 4). In addition, the author proves the development of students' professional skills when working with MOOCs and the improvement of effective communication between teachers working with learning platforms. It should be noted that the conclusions drawn by Alhazzani confirm the results of our study showing improvement in students' professional skills after working with MOOCs.

Sherman Young conducted a study of demand factors for MOOCs among university students. The main purpose of the study was to identify the demand factors for MOOCs among students and faculty at local universities, their opinions on the pros and cons of distance education, and their attitude toward integrating online courses (Young, 2018: 21). Of interest are the results indicating the motivation for learning via MOOCs among students and faculty:

- 76% of survey participants believe that MOOCs enhance professional skills in their major/subject

- 10.6% of the students and teachers assert that MOOCs can improve academic performance

The questionnaire data confirms our results about improving professional skills using MOOCs (71% and 76%).

Of special interest is a report on the use of MOOCs in UK higher education based on MOOC development in the US and Canada. A growing number of institutions are engaging and experimenting with MOOCs to increase access, marketing, and branding, with the potential to develop new revenue streams. The motivations for students to participate in MOOCs are varied, and many find it difficult to engage and remain motivated in the context of a distance learning environment. The researchers' main question was, "Do MOOCs follow a sound pedagogy and organizational approach to online learning that will lead to quality outcomes and experiences for students?" (Li, 2013, p.11). The authors conclude that few institutions have enough staff with significant knowledge of online pedagogy involved in developing these courses. MOOCs offer great opportunities for non-traditional forms of student-centered teaching. This demonstrates the author's affirmation of the importance of improving knowledge and skills through the use of MOOCs.

The paper by Nappa M. Shalatska investigates the impact of MOOCs on mastering the ESP course at GOU VPO Krivoy Rog National University. One hundred and twenty-four students from eight groups of the Faculty of Information Technology were randomly divided into control and experimental groups. The control groups studied English by following the current syllabus for independent work. The experimental groups enrolled in MOOCs at FutureLearn and met with the instructor once a week for an hour-long class. The pre-test showed no significant difference between English proficiency levels: mean EG score = 57%, mean CG score = 59% (Shalatska, 2018, p.188). The author concludes that the study showed no significant

difference between the pre- and post-test scores in the control groups. The scores of students in the experimental groups in the pre-test for content knowledge taken before integrating MOOCs and the post-test taken afterward showed an increase in their knowledge of English for professional purposes (6% increase in high score, 8% increase in average score, low score decreased by 14%). A high level of knowledge was found in 25% of students and an average level in 65% of students, demonstrating the ability of students to learn via MOOCs, work independently, gain new knowledge, and develop themselves. Successfully implementing MOOCs can bring new opportunities for students: improving English language proficiency and developing critical thinking, decision-making, problem-solving, and time management. One disadvantage the research found when using MOOCs for teaching foreign languages is the lack of feedback from the teacher.

The study by Napp M. Shalatska confirms the data obtained in this analysis, indicating learner interest in online courses and increased assimilation of materials within the distance learning framework. The disadvantage identified can be prevented by including a chat with instructors and answers to questions posed on the platform.

Conclusion

The purpose of this article was to study the effectiveness of using MOOCs to teach a professional-oriented foreign language at a technical university. Applying a mixed method with MOOC integration proved effective. The empirical results demonstrate that the method improves communication skills in the main speech activities, expands professional vocabulary, and enriches theoretical knowledge within the student's specialty. The results indicate that using MOOCs within the professional-oriented foreign language discipline improves educational results in comparison with traditional education. The use of system-activity and communicative approaches unlocks new opportunities for students, like increasing English proficiency, developing critical thinking, solving problems, managing time, and learning more about their discipline.

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