Enhancing Students' Listening Comprehension Skills through AI-Based Podcast Activities: A Study in Self-Study Mode

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Abstract. **The increased number of learning hours for students' self-study in university ESP courses, on the one hand, and the high requirements for future engineers in the world labour market, on the other hand, confirm the necessity to foster students' ESP skills in a self-study mode. Thanks to the rapid development of educational technologies, studying any discipline can be made interesting and effective. Our study suggests that utilizing AI tools in engineering podcast activities can improve engineering students' listening comprehension skills in self-study mode. The post-study test designed with the help of the YT Class platform which generates assessment tests for video content, is compared across the control and experimental groups (52 third-year engineering students). The participants of both groups had experience using Ted podcasts in ESP learning and previous research proved the efficacy of implementing such activities in ESP classrooms with the first-year students of the Engineering and Technology Department. The final test based on the results of the processed podcasts was evaluated at 100 points, where the high score level was set at 60 points. In the experimental group, 15 students scored more than 60 points, in the control group, 8 students received more than 60 points. To confirm or refute the hypothesis that the proportion of students who received more than 60 points in the experimental group is higher than in the control group, the Fisher criterion was used. The progress of the students in the experimental group was statistically proven. AI-based podcast listening activities of engineering students outside the classroom prove to be a significant tool for improving students' listening comprehension skills and inspiring curiosity and motivation to further development.**

Keywords: AI tools, ESP skills, Ted podcasts, YT class platform; listening comprehension skills; Fisher's criterion

I. INTRODUCTION

Since Ukraine has declared its intention to become an equal partner in the framework of the Bologna Process, it is expected that Ukrainian universities will carry out the educational process under European standards of language proficiency. To complete the Bachelor's degree at the same time, the student is obliged to work effectively with the English language of the professional

content. The current tendency in Ukrainian technical universities to minimize classroom hours and increase the hours for students' independent work indicates the necessity to implement ESP learning and teaching strategies that contribute to the development of students' personalized learning. Recent pedagogical experiments on applying technology in the educational process showed its effectiveness with engineering students in ESP classrooms, in particular. Nowadays, the implementation of artificial intelligence (AI) tools has strongly influenced English for Specific Purposes (ESP) teaching and learning. AI-powered systems can adapt to the individual needs and skill levels of learners, providing them with personalized learning experiences, analysing learners' performance and providing them with relevant, tailored learning resources, detailed feedback to learners on their speaking, writing, pronunciation, and grammar skills. In our opinion, university language instructors should explore the potential of AI tools to compensate for the lack of classroom hours and encourage engineering students' autonomous work in ESP learning.

In 2021 a group of scientists found and analyzed 454 papers indexed in Scopus and Web of Science according to PRISMA Statement. As a result, 22 papers devoted to the main use of AI in education were selected. The authors claim that AI is used for formative evaluation and automatic grading of students. Several studies examined the differences between the use of AI and its non-use [1]. Reviewing the related studies conducted on the implementation of AI tools in ESP learning revealed that AI offers great education opportunities and can serve as an effective tool for the preparation and implementation of teaching units and evaluation of students' written assignments [2].

Integrating AI writing tools (Quillbot, WordTune, Jenni, Chat-GPT, Paperpal, Copy.ai, and Essay Writer) can improve students' writing quality, content and organization [3, 4], the logical arrangement of ideas [4]. To improve the production of written text in English the researcher's laboratory designed an AI-based web application called "AI KAKU" [5]. Preliminary results of their study indicate that this application assists in structuring written texts. A study by Lam and Moorhouse [6] found that WordTune helps not only to improve grammar skills but also influences to reduce stylistic errors.

Several studies have demonstrated the efficacy of AI-based ESP learning in vocabulary acquisition. The students of the Business Department at the University of Bisha used the Dialogflow Chatbot in ESP online learning [7]. The results showed that the students in the experimental group who used the Dialogflow Chatbot outperformed their counterparts in the control group.

Classtime.com AI-based online testing platform was used with Economic Sharia Law students and explored the students' feedback on the effectiveness of the platform. The outcomes showed how these platforms have the potential to be useful instruments for evaluating students' knowledge and proficiency in language teaching [8]. AI-based ESP learning can also be used to create differentiated educational content to teach and learn business English. It can generate materials that arouse the curiosity of the learners regarding the correct use of specialized terminology [9]. AI visual generation tools were used to design AI-based teaching lesson plans in the field of English for Specific Purposes (ESP), with a focus on Tourism at Spain University to facilitate the acquisition of subject-specific cultural and linguistic notions [10]. Authors claim that the possibilities that AI offers to education are enormous, especially for tutoring, assessment and personalization of education, and most of these are yet to be discovered [11]. Furthermore, technology and pedagogy must walk together [12].

The critical analysis of research in the field of AI in ESP learning allows us to declare its high practical value, especially for developing writing skills, profession-based vocabulary expansion, assessment and personalization of education. Although, most of these are yet to be discovered [11]. Therefore, we consider the YT Class platform which generates assessment tests for engineering podcast content a useful tool for improving students' listening comprehension skills.

Based on ESP teaching experience at "Podillia State University" the aim of the article is to explore the impact of the YT Class platform on improving profession-based listening comprehension skills.

II. MATERIALS AND METHODS

One of the simplest methods of testing the effectiveness of AI tools in ESP learning is post-test-only design. The research was conducted based on the "Podillia State University". In this design, we used two groups. Respondents were 52 third-year students from the Engineering and Technical Department. The experimental period lasted for five months (6th semester 2023) in a self-study mode. Due to the university syllabus, the students had a mandatory ESP course (2 academic hours a week). The correlation of classwork and self-study due to the syllabus was 1 to 2. Both groups had an equal number of ESP classes. The experimental and control groups were given a task to process 4 engineering podcasts devoted to Modern technology in agriculture, Combine harvesters, fertiliser machines, and Machines for flour production. The students of both groups had the experience of using technology such as the Quizlet platform for vocabulary acquisition and Ted podcasts in the 1st, 2nd, 3rd, 4th and 5th semesters. During this period of ESP learning podcast activities included multiple watching and listening, segmenting longer episodes into chunks, generating a list of terms, summarising and paraphrasing. Less frequent activities included letters to a podcaster, bingo, and posting comments.

To conduct the experiment the students of the experimental group were given instructions on using the YT Class platform and AI-mentor in engineering podcast activities. AI-mentor at the YT Class platform provides support in podcast content processing by answering questions, creating lists of terms, tests and different kinds of exercises. The control group also worked on the same podcasts and highlight the key points using the standard above-mentioned podcast activities. Both groups underwent the same test. To determine whether the experiment had a significant effect statistical analysis was used.

Participants of the pedagogical experiment agreed to participate in it without pressure. The experiment was conducted in compliance with all ethical requirements

III. RESULTS AND DICUSSION

YT class is a free AI-based platform service. The language of the interface is English and registration is not obligatory. The main advantage of this service is its ability to supervise the students in working on podcasts in a self-study trajectory.

The post-test was made up of 40 questions based on 4 engineering podcasts, 10 questions for each video. We used the structure of the IELTS listening comprehension test. The questions tested the student's ability to understand the main ideas and factual information, the attitudes of speakers, and the ability to follow the development of ideas. The test included multiple choice questions, matching, diagram labeling, filling the gaps, sentence completion and short answer questions. The test was graded on a 100-point scale, where 60 points and above are defined as "passing" the test. In the experimental group, 15 out of 27 students passed the test, in the control group 8 out of 25. Can we assume that the proportion of students who passed the test in the experimental group is significantly different from the proportion of students who received 60 or more points in the control group? Therefore, we test the hypotheses formulated above. Fisher's test is designed to compare two samples in terms of the frequency of occurrence of the effect of interest to the researcher. It makes it possible to assess the significance of the difference between the fractions of both samples in which the effect was manifested. Since we have used only two gradations, namely, passing and failing the test, it is advisable to use the Fisher criterion. In addition, the size of the samples allows us to use this criterion. The proportion of students with "there is an effect" (passed the test) corresponds to an angle in the range from 0° to 180°, the comparison of the shares in the two samples becomes equivalent to the comparison of the angles 1 and 2. Next, we find the experimental value of the φ criterion. For convenience, we use MS Excel. The results of the statistical data analysis are shown in Table 1.

TABLE 1 THE RESULTS OF THE STATISTICAL DATA ANALYSIS

Groups	n	"Passed"	P_i	φ_i	$\varphi_{exp.}=$
Experimental	27	15	0,556	1,682	1,73; $\varphi_{cr.}$=1,64 at $\rho \le$ 0,05
Control	25	8	0,320	1,203	$\varphi_{exp.} > \varphi_{cr.}$ H1 hypothesis is excepted

According to the table of critical values of Fisher's φ-Test, we find $\varphi_{cr.} = 1,64$ for the significance of $\rho \le 0.05$. Hence, $\varphi_{exp.} > \varphi_{cr.}$, the experimental hypothesis is accepted – a significant difference in the proportion of those who coped with the task in the groups is obvious. Thus, the fact that the share of increased scores in the first group exceeds the share in the second group is statistically significant.

The present study investigated the impact of the YT class platform on improving engineering students' ESP listening comprehension skills in self-study mode. The study is an attempt to exploit the potential of both students' self-study provided by the ESP syllabus and technology to improve listening comprehension skills. Language instructors have to re-think the approaches to ESP teaching due to constant increase in hours for independent work in the ESP curriculum. Ideally, such amount of hours for ESP self-study may give students additional opportunities to practice and reinforce their language skills to delve deeper into the specific content areas of their ESP course. But most important, self-study encourages students to take ownership of their learning and become more independent learners. However, a lack of guidance, interaction, motivation and time management prevents them from getting good results in ESP courses in self-study mode. Besides, listening is one of the most challenging skills in foreign language acquisition, especially for non-native educators. Thereby it is preferable to utilize native experts' speech patterns in ESP class [14]. Profession-based podcast integration in the education process can assist in improving listening comprehension skills in professional contexts [13], [14]. In contrast, our study suggests that podcasts can be used by engineering students autonomously. To have a positive effect podcasts should be supplemented by more advanced tools. Thus our study is in line with [12] that education must engage technology to benefit ESP teaching and learning. We decided to go further in our research and use the technology that can supply the students with assistance, interaction, communication and feedback. Artificial Intelligence tools have all the above-mentioned features. Most of the researchers studied the students' writing, grammar skills, vocabulary acquisition, evaluating students' knowledge and generating lesson plans, while we tried to examine the impact of engineering podcast-based activities through the YT class platform on students' listening skills in the Ukrainian context.

Based on the experience gained in the course of the study we created some tips on implementing engineering podcasts through the YT class platform:

1. Engineering students should have prior experience in using technology in ESP learning. It is worth mentioning that it is very difficult for students to grasp complex engineering topics and terminology. That is why the knowledge of how podcasts work for foreign language purposes, and the types of pre- and post-podcast activities the students can use in their independent study can benefit their learning outcomes.

2. When teaching EFL during 1st and 2nd years of study we preferred to use mini podcasts (5-10 minutes). During the experiment, we used mid-length (20-40 minutes) engineering podcasts.

3. Provide the students with instructions on how AI mentor works. By offering personalized support, language assistance, comprehension aids, interactive activities, and progress tracking, AI mentor can enhance students' self-study experience with ESP podcasts and help them achieve their learning goals more effectively.

IV. CONCLUSIONS

Rapid technological advancements and Artificial Intelligence, in particular have revolutionized all aspects of our lives, including education. High demands for foreign language fluency among future engineers, on the one hand, and reduction of academic hours for ESP classroom learning, on the other hand, encourage university teachers to modify traditional teaching models by learning new digital tools, testing their effectiveness and implementing them into practice.

The conclusion from the present research is that the application of the YT class platform has a substantial influence on improving such language skills as listening comprehension in self-study mode, proved by the statistical analysis of the post-test outcomes. YT class platform and its AI mentor provided students with the simultaneous possibilities to provide personalized learning recommendations, offer language support (grammar and pronunciation assistance, creating vocabulary lists, tests and quizzes on podcasts, contextual explanations), assessing learning outcomes. Ultimately, the YT class platform is beneficial for students concerning the independent learning process. Further researches are claimed to study the attitude of engineering students towards applying the YT class platform in their self-study.

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