Implementing IT in engineering education

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Abstract. Nowadays in the multicultural workplace engineers need both hard skills and soft skills. They need to be good communicators, as they need to collaborate with others, convince their opponents when negotiating in order to gain benefit for a company and society. Students engineers could have difficulty in achieving success in the future professional field, as their communication skills, the most beneficial skills in the 21st century, are not being developed properly as hard skills development is a priority during the engineering education. In the modern world Information Technologies play an important role in education, including teaching and learning due to their didactic potential. They provide an opportunity to differentiate instruction and change classrooms into dynamic learning environments. The aim of research was to elaborate a technique for developing engineering students' communication skills through radio podcasts. Research methods included a literature review, analysis and synthesis, experimental work, assessment of the development level of engineering students' communication skills, analysis of the data obtained. As a result, a teaching technique was elaborated for the development of engineering students' communication skills through radio podcasts that includes (1) organizing students' individual, team and group work on podcasts; (2) filling a portfolio with analysis of the podcasts; (3) role-playing podcasts using the revealed speech and non-speech features; (4) creating own podcasts, focused on a specific thematic content. Experimental work was held in 2022 and 2023 at Higher Engineering School, Industrial university of Tyumen, Tyumen, Russia. It investigated the effectiveness of using the technique for developing communication skills through radio podcasts among engineering students. The results of pre-test and post-test confirmed the positive dynamics of the development of communication skills through radio podcasts among engineering students of the experimental group. The prospects for further research is that the technique presented in research can be employed in communication skills development among university students of different majors, and can complement engineering education.

1 Introduction

Nowadays in the multicultural workplace engineers need both hard skills and soft skills. They need to be good communicators, as they need to collaborate with others, convince their opponents when negotiating in order to gain benefit for a company. Students engineers could have difficulty in achieving success in the professional field, as their communication skills,

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the most beneficial skills in the 21st century, are not being developed properly as hard skills development is a priority during the engineering education. In the modern world Information Technologies play an important role in education, including teaching and learning due to their didactic potential. They provide an opportunity to differentiate instruction and change classrooms into dynamic learning environments. Some media technologies increase motivation to communicate and make the learning process exciting (J. Ahmad, 2012 [1]; I. Xodabande, 2017 [2]). Podcasts are increasingly used in innovative ways, particularly in higher education, where they have the potential to transform teaching and learning (C.-Y. Liu, 2023; A. Saeedakhtar, R. Haqju, A. Rouhi, 2021; E. V. Zarutskaya, 2019; N. A. Ignatenko, 2016; D. V. Dmitriev, A. S. Meshcherekova, 2014; P. V. Sysoev, 2014; H. R. Kargozari, N. Zarinkamar, 2014; M. Rahimi, F. Asadollahi, 2011; E. Yu. Malushko, 2011; D. U. Bolliger, S. Supanakorn, C. Boggs, 2010) [1-14, 16].

The popularity of using podcasts in teaching and learning is due to their real-time availability, authentic resources, free downloading, universal audio and video file formats, and a wide range of available podcasts, scripts for audio files or subtitles for video files (E. Yu. Malushko, 2011[3]; D. V. Dmitriev, A. S. Meshcherekov, 2014 [4]).

The use of podcasts in teaching and learning is due to their didactic potential that is authentic resources (created by native speakers, they represent the sociocultural reality of the country, demonstrate a combination of verbal and non-verbal communication codes, show the functioning of the language in a natural environment), the content of podcasts meeting students' interests, needs, and learning opportunities, multifunctional purposes (with the help of podcasts, one can develop reading, listening, speaking, and writing skills), multichannel perception (information is received through visual and auditory channels), content communicative orientation (O. V. Borshcheva, 2021 [5]; E. Yu. Malushko, 2011[3]; D. V. Dmitriev, A. S. Meshcherekov, 2014 [4]).

Thematic compliance with the curriculum, the correspondence of the language content of the podcast to the student's communication skillls level and interests, podcasts content oriented to real communicative use, the clarity of the diction of the presenters, the expressiveness of intonation, the natural pace of speech, the reliability of the information provided are determined as criteria for selecting podcasts in teaching engineering students (E. Yu. Malushko, 2011[3]; D. V. Dmitriev, A. S. Meshcherekov, 2014 [4]).

Podcasts, representing an inexhaustible source of authentic speech, allow educators to create an atmosphere of communication in the classroom, immerse students in a communicative environment, engage students in conversation, have an emotional influence on them (N. A. Ignatenko, 2016 [6]), as a result, students respond to the problem under discussion, moreover they get acquainted with the rules of etiquette, peculiarities of culture, life and traditions, learn to perceive and analyze linguistic and sociocultural information (E. V. Zarutskaya, 2019 [7]).

Podcasting has benefited the academic environment, and students are motivated to use podcasts integrated by educators into their online and offline courses (M. Rahimi, F. Asadollahi, 2011 [8]; D. U. Bolliger, S. Supanakorn, C. Boggs, 2010 [9]). The use of podcasts in teaching allows educators to effectively solve a number of educational tasks. Students develop their skills "from understanding the general meaning to interpreting the extracted information" (P.V. Sysoev, 2014 [10]); they improve oral informal communication skills (E. V. Zarutskaya, 2019 [7]), listening and speaking skills (N. A. Ignatenko, 2016 [6]); pronunciation skills by repeatedly listening to native speakers and repeating after them (J. Ahmad, 2012 [1]); they enrich their vocabulary by listening to podcasts together and interacting with peers during the follow-up activities (C.-Y. Liu, 2023 [11]; A. Saeedakhtar, R. Haqju, A. Rouhi, 2021 [13]; H. R. Kargozari, N. Zarinkamar, 2014 [12]); they increase their motivation to perceive authentic speech, and they develop the sociocultural observation (N. A. Ignatenko, 2016 [6]). The didactic potential of podcasts makes it possible to

personalize teaching students with different levels of English proficiency in the classroom and in the self-learning environment (Yu. V. Baklagova, 2022 [14]; N. A. Ignatenko, 2016 [6]; E. V. Zarutskaya, 2019 [7]; J. Ahmad, 2012 [1]).

An analysis of literature revealed a contradiction between the importance of improving communication skills among engineering students and the insufficient use of the potential of English radio podcasts in practical classes in English at a university.

The object of the research: the process of improving engineering students' communication skills in the classroom. The subject of research: the content of training focused on improving engineering students' communication skills. The aim of research is to elaborate a technique for developing engineering students' communication skills through English radio podcasts.

Research problem: how to improve engineering students' communication skills in the classroom? Suppose that the development of engineering students' communication skills will be effective if teaching is based on a podcasting technique which implies the enrichment of the training content with authentic English radio podcasts that will familiarize students with the realities of the country within the communication topics established by the curriculum, correspond to their level of English proficiency, arouse interest, stimulate spontaneous speech, and involve students in discussion. As a result, positive dynamics in the development of engineering students' dialogic speech skills in English will be ensured.

The aim of research involves the solution of the research tasks:
- (1) to clarify the essence and composition of engineering students' communication skills;
- (2) to reveal the didactic potential of English radio podcasts in teaching engineering students;
- (3) to elaborate a technique for developing engineering students' communication skills.

2 Materials and Methods

A literature review was conducted to explore these research tasks. The review process involved three steps: searching, selecting and analysing, in order to identify the most relevant articles necessary to explore the research tasks.

2.1 Participants

Experimental research on the development of dialogic speech skills in English of undergraduate students receiving engineering education took at Higher Engineering School, Industrial University of Tyumen, Tyumen, Russia in 2022 and 2023 academic year. The experiment involved 60 students. According to the pre-test results the experimental (30 students) and control (30 students) groups were formed. In both groups the students had approximately equal level of the development of dialogic speech skills in English. The age of participants was from 16 to 18; they were all high school graduates. They were learning English as a foreign language. During the experiment they were not receiving any additional English language education in private English language schools. They were not informed about the experiment to make the learning environment as natural as possible.

2.2 Materials

The source for the selection of radio podcasts was the English site https://www.bbc.co.uk/learningenglish/english/features/the-english-we-speak.

Communication of English-speaking presenters is an interaction, where the interlocutors are interested in talking with each other, and they see each other as individuals. A distinctive

feature of podcasts from 'The English we speak' is that in each episode, the hosts discuss an idiomatic expression that gives students an idea of the way of thinking, culture and mentality of the English. The structure of each podcast is set by a certain frame: greeting - informal conversation - highlighting of an idiomatic expression - discussion of meaning of the idiomatic expression – its illustration by context - informal conversation - farewell. The language of the podcast is characterized by naturalness, emotionality, and authentic discursive characteristics.

When choosing a podcast, we were guided by the following criteria: (1) podcast content related to the topics included in the studying course, (2) students' interests, (3) students' level of communication skills, (4) podcast content oriented to the development of oral speech skills and real communicative use. Table 1 provides the content of the academic disciple 'Foreign (English) language', enriched with English radio podcasts.

Table 1. The content of the academic disciple 'Foreign (English) language', enriched with English radio podcasts

Topics	Title of the podcasts
1. Me and people round me	A barrel of laughs, Pain in the neck, Icebreaker, A sticky situation, Wild card, People person, Give the cold shoulder, All over the place, Like water off a duck's back, Part of the furniture
2. Leisure and hobbies	The CEO of, Yolo, Me time, Killing time
3. Education	The university of life, Crash course, Have a lot of plates spinning, Is student life all good
4. Travel and tourism	Couch surfing
5. English speaking countries	Punctuality, Blah,blah, blah, On the top of my tongue, Pie in the sky, To miss the boat, Cold feet
6. Russia, Tyumen region, Tyumen	Feeling good about your country
7. World of new technologies	Digital detox

2.3 Methodology

Based on research by E.V. Zarutskaya (2019) [7], we developed a teaching tool for assessing the development level of engineering students' dialogic speech skills. It was used by educators at the beginning and at the end of the experiment. Educators evaluated the degree of manifestation of the student's speech actions on a five-point scale:
- 5 points - high level (the speech action is manifested steadily regardless of the conditions of the situation);
- 4 points - high level (the speech action is manifested clearly and steadily);
- 3 points - average level (the speech action is manifested depending on the conditions of the situation);
- 2 points – low average level (the speech action is not clearly and rarely manifested);
- 1 point - low level (the speech action is not shown).

Table 2 shows the assessment tool for the development of dialogic speech skills in English of engineering students.

Table 2. Teaching tool for assessing the development level of engineering students' communication skills in English

Communic ation skills	Student's speech actions	The degree of manifestation of speech actions				
		5	4	3	2	1
skills to make a contact	the student uses contact-establishing means of starting a conversation: an appeal, a greeting, a compliment					
skills to maintain a contact	the student takes the speech initiative, joins the discussion, observes the order of remarks, demonstrates feedback, asks the interlocutor for clarification, corrects the communication process depending on the partner's speech remarks, uses non-verbal means of communication in accordance with accepted norms					
Skills to complete a contact	the student uses the speech clichés of farewell, taking into account the accepted norms and the speech situation, informs the interlocutor about the positive feedback about the contact)					

3 Results

A literature review revealed that communication is "a complex process of interaction between people, consisting in the exchange of information, as well as in the perception and understanding of each other by partners" (G. M. Andreeva, 2001 [15]), "a dynamic interactive process that involves the effective transmission of facts, ideas, thoughts, feelings and values" (M. Rahman, 2010 [16]). Effective communication, both written and oral, is often emphasized in foreign language education as the skills to build effective communication and interaction in a foreign language, taking into account the norms of

etiquette and the rules of communication in a given culture. So, communication skills that are needed to ensure effective oral communication in English are skills to start, maintain and complete a verbal contact, taking into account the norms of etiquette and the rules of communication (E.V. Zarutskaya, 2019 [7]).

The didactic potential of English language radio podcasts in the development of communication skills lies in the subject, linguistic and sociocultural content. They contain authentic language and speech patterns, natural intonation and pronunciation, expressions used in real life.

The experiment was conducted in three stages: the ascertaining, formative and controlling stages. At the ascertaining stage of the experiment, with the help of the developed assessment tool, it was found that engineering students from the experimental and control groups had a low level of the development of communication skills, which confirmed the need for a formative stage for the development of communication skills through English language radio podcasts.

At the formative stage, teaching engineering students of the control group covered all aspects (reading, speaking, writing, listening) of learning a foreign language within the topics established by the curriculum and was focused on memorizing words on the topic, reading and translating texts, discussing their content, listening audio files. Listening exercises were traditionally before, during and after listening.

The learning content of the experimental group was enriched with BBC English language radio podcasts, selected according to the criteria. Teaching engineering students was organized on the basis of a technique developed by the author of the article. The technique of the development of engineering students' communication skills included (1) organizing students' individual, team and group work on podcasts; (2) filling a portfolio with analysis of the podcasts in terms of their thematic, linguistic, extra linguistic and sociocultural content; (3) role-playing podcasts using the revealed speech and non-speech features; (4) creating own podcasts, focused on a specific thematic content. During the first listening, in individual work students focused on understanding the main content of the podcast and recognizing an idiomatic expression with its meaning. After the second listening, in pair work students were engaged in exchange of information, clarification, verification and confirmation of facts. After the third listening, in group work students summarized the content of the podcast, discussed the national and cultural characteristics of verbal and non-verbal behavior, determined their attitude to the content, and exchanged opinions. Based on the audio script of the podcast, students filled out the diary "analysis of podcasts". They wrote down the topic, the idiom under discussion and its meaning, linguistic (verbal) and extra linguistic (non-verbal) features of the behavior of the presenters. Then, the students played the podcast situation in compliance with the rhythmic-intonation, lexical, and grammatical features of English speech. At the final stage of work on the topic under study the students created their own podcast, recorded and published it in instant messengers, for example, Telegram, Viber, etc. Then, they listened and discussed published podcasts in the classroom.

At the control stage of the experiment, an assessment of the dynamics of the development of engineering students' communication skills at the ascertaining and control stages was made among students from the experimental and control groups. According to the diagnostics, after the conducted experiment the students from the experimental group had the following levels of development of dialogic speech skills: medium – 16 students, high – 12 students and low – 2 students. Compared to the ascertaining stage, the number of students from the experimental group with a high level of development of dialogic speech skills in English changed from 5 to 12 students (from 6 to 8 students in the control group), with an medium level from 17 to 16 (in control group from 17 to 18 students in the control group), with a low level from 8 to 2 students (in the control group from 7 to 6 students). The absence of positive dynamics in terms of the medium level can be explained by the fact that some

students moved to a higher level in the course of the experiment: from low to medium and from medium to high.

The analysis of the data obtained at the control stage of the experiment confirmed the effectiveness of the development of engineering students' communication skills through English radio podcasts in the educational process.

4 Conclusion

In terms of conceptualizing the idea of developing engineering students' communication skills the main results of research are the following:

1). Communication skills are considered as skills to build effective communication and interaction, taking into account the norms of etiquette and the rules of communication.

2). Communication skills include skills to start, maintain and complete a verbal contact, taking into account the norms of etiquette and the rules of communication.

As a result, a technique has been elaborated for the development of engineering students' communication skills through English radio podcasts that due to the subject, linguistic and sociocultural content allow students to familiarize themselves with the realities of the country within the communication topics established by the curriculum, correspond to their level of communication skills development, arouse interest, stimulate spontaneous speech and involve students to the discussion.

Implementing the technique into the engineering education, focused on the development of engineering students' communication skills through English radio podcasts, turned out to be effective. Students engineers are willing to take the speech initiative, join the discussion, demonstrates feedback, ask the interlocutor for clarification, correct the communication process depending on the partner's speech remarks, uses non-verbal means of communication in accordance with accepted norms. The traditional learning environment did not cause changes in the development of engineering students' skills of communication skills, since the comparative results of the ascertaining and control stages of the experiment in the control group remained practically unchanged.

The prospects for further research is that the technique presented in research can be employed in communication skills development among university students of different majors, and complement the content of engineering education.

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