UDC 378.147:372.881.111.1(045)

Lesia M. Konoplianyk
PhD of Pedagogical Sciences, Associate Professor,
Associate Professor of the Foreign Languages and Applied Linguistics Department
National Aviation University, Kyiv, Ukraine
ORCID ID 0000-0002-3244-1965
lesia.konoplianyk@npp.nau.edu.ua

Kateryna S. Melnykova
Lecturer of the English Philology and Translation Department
National Aviation University, Kyiv, Ukraine
ORCID ID 0000-0002-8857-1830
kateryna.melnykova@npp.nau.edu.ua

Yuliia Yu. Pryshupa
PhD of Pedagogical Sciences,
Associate Professor of the Foreign Languages and Applied Linguistics Department
National Aviation University, Kyiv, Ukraine
ORCID ID 0000-0002-5617-4152
yuliia.pryshupa@npp.nau.edu.ua

IMPLEMENTING THE FLIPPED CLASSROOM: A CASE STUDY OF TEACHING ESP TO THE BACHELORS IN AUTOMATION AND COMPUTER-INTEGRATED TECHNOLOGIES

Abstract. The paper describes the experience of flipped classroom application in teaching ESP. The study was held at the National Aviation University and involved 46 undergraduate students majoring in "Automation and Computer-Integrated Technologies". In-class learning was organized according to the university schedule and out-of-class activities were conducted by using Google Classroom and a set of digital learning tools. Our observations during teaching with their further analysis and a designed questionnaire were used to reveal the benefits and drawbacks of the flipped classroom. The analysis of the students' responses has shown that it allows students to study at their own pace, meet their needs, develop their organizational, communication and time management skills and increase their independence and creativity. The paper specifies three main phases of the flipped classroom and determines what skills are developed at each of them. Remembering and understanding are developed at the first phase and the freed classroom time is devoted to developing the skills of applying and analyzing. The higher-order thinking skills of evaluating and creating can be formed both in the classroom and during the post-class phase. The authors have selected digital learning tools which can be recommended for learning ESP in order to facilitate students' out-of-class activities. Their use can help to shift the emphasis from the teacher to the student, increase students' engagement in learning and make the course versatile and appropriate to students' needs. A student survey was conducted at the end of the academic year, and the analysis of students' responses revealed that they had a positive attitude to implementing the flipped classroom in teaching ESP. As shown by the results of the study, the use of the flipped classroom for teaching ESP is effective as it saves much in-class time for communicative tasks enhancing the development of higher-order thinking skills, unites in-class and out-of-class learning, controls students' achievement not only in the classroom but outside it and makes the learning process more engaging.

Keywords: flipped classroom; flipped learning; ESP; digital learning tools; Google classroom.

1. INTRODUCTION

The problem statement. The higher education system of Ukraine has experienced a paradigm shift in the 21st century and now it is striving to improve the quality of teaching and

© Lesia Konoplianyk, Kateryna Melnykova, Yuliia Pryshupa, 2021.

learning, ensure accessibility of education and focus students on developing the skills of independent knowledge acquisition which are vital in constantly changing information space. Students have to be active knowledge discoverers, so the teacher's role is a facilitator. This shift requires a change in both the content of learning and approaches to teaching, and encourages wide integration of information and communication technologies (ICT) in higher education. Modern students have to navigate through a variety of information, analyze it, make decisions, collaborate with peers to accomplish complex tasks, represent their knowledge to others, i.e. they have to acquire twenty-first-century skills required in a technological society. Moreover, we cannot ignore the rapid development of ICT, affecting the lifestyle, education and professional activity of the Ukrainians. Therefore, it is difficult to imagine learning without using ICT and digital tools: with new applications and learning platforms, students are exposed to a more student-centred learning experience [1, p. 122] and digital skills are becoming crucial skills of the 21st century. University students often add online courses located on edX, Coursera, FutureLearn platforms to their educational program, making the Internet a vital tool in learning.

Higher education focuses on the intensification of students' learning, improvement of knowledge quality and development of specific competencies and skills needed to function effectively in the modern world. The current requirements for higher education also include accessibility, inclusiveness, flexibility, the individual trajectory of students' learning and introduction of dual education. The priority areas of the modernization of higher education cannot be fully implemented within traditional education due to its limited capabilities in the context of new realities and challenges of the time (e.g. the need to process large amounts of information, be flexible and adaptable) and insufficient focus on students' individual needs. Therefore, educators search for new effective methods that can be used in combination with the traditional ones for motivating students and developing twenty-first-century skills: critical thinking and decision-making, communication and collaborative skills, independence and initiative, resilience, creativity and responsibility, information processing skills, digital skills, leadership and striving for lifelong learning [2, p. 2]. Students must learn to be flexible and adaptable to deal with the rapidly changing world, work cooperatively with peers, come up with solutions to the arising problems and "think outside the box".

One of the ways to achieve these goals is to use blended learning, which provides an optimal combination of the benefits of traditional and distance learning. When some of the theoretical material is learned by students on their own, classroom activities can be more intense and effective. One of the instructional innovations of blended learning is the flipped classroom, where students study online materials before coming to class, so that class time is dedicated to discussions, assistance or a spectrum of activities to develop higher-order thinking skills [3, p. 458].

The reason for our choice of this technology in teaching "English for Specific Purposes" (ESP) at the National Aviation University, Ukraine, was the need to organize students' self-study in view of the decrease in the classroom hours and increase in the hours for self-study, engage them in deeper learning, motivate them to cognitive activity and prepare for lifelong learning.

Proficiency in ESP is a professional necessity for IT students (in our case, the students majoring in "Automation and Computer-Integrated Technologies"), because their future job involves specific oral and written communication. Moreover, a lot of IT terminology is borrowed from the English language, software codes are written in English, the majority of IT products are first created with English interface and only then upgraded with other language support. Since modern society requires competitive IT professionals able to communicate fluently in professional environment all over the world, the issue of teaching ESP is one of the

most vital at technical universities because such students face the problem of mastering both English communicative competence and professional competence.

The ESP course at technical university is aimed both at acquiring linguistic knowledge and extending professional knowledge with its further application in future professional activities. Thus, the specifics of the ESP course involves the integration of the general English language and the students' major, and its goal is to prepare the students to solve professional issues by means of the English language. ESP is designed to meet students' professional needs, that is why the content of the materials and activities of this course as well as the language instruction focus on specific professional fields. Thus, students study English not because they are interested in it as such but because they need it for study or work.

Analysis of recent studies and publications. The flipped classroom, where home assignments precede in-class work, is growing in popularity today. Most frequent examples are the use of online videos to deliver course content outside class [4, p. 64]. In the flipped classroom, information transmission takes place outside the classroom in the form of lectures generally delivered through videos [5] or alternative presentation formats [6] and even readings. However, as A. Sams and J. Bergmann explained, the flipped classroom is not as much about using videos for learning outside the classroom as it is about how to best use in-class time with students, because the replacement of in-class theoretical explanations with the video to watch at home creates more available in-class time for active learning [5]. They believe that modern students find videos appealing [5], and R. Jaster adds that students learn better from visual-based instruction than from conventional teaching [7, p. 2]. In-class work involves building conceptual understanding and developing cognitive skills through active and collaborative learning [4, p. 63]. Thus, it is active learning, rather than the structure of the flipped classroom, that leads to higher student performance [7, p. 2]. In traditional learning, the teacher facilitates content attainment, whereas in flipped learning students are responsible for content attainment before class [7, p. 2].

Though the flipped classroom started in university programs much earlier, it was only called "flipped" by J. Bergmann and A. Sams in 2007 [5]. The reasons for its application are the need to organize students' self-study in an effective way, develop their cognitive activity, focus their attention more on understanding and application than on recollection of facts, give them a greater sense of responsibility for learning, and provide them with more control of their learning outcomes [8, p. 11].

Ukrainian and foreign researchers investigating flipped learning agreed that it is one of the ways of improving the educational process aimed at training highly-qualified professionals and encouraging them to lifelong learning. Significant contribution in the theoretical and practical aspects of the implementation of the flipped classroom was made by J. Bergmann and A. Sams [5], J. Baker [8], B. O'Bannon [7], S. Brame [9], C. Howitt and M. Pegrum [3], C. Herreid and N. Schiller [4], D. Berrett [10], B. Tucker [11], R. Jaster [6].

In Ukraine, the flipped classroom is a relatively new phenomenon, however, it is becoming an important teaching approach allowing students to learn in an interactive learning environment. Since 2014, its implementation in teaching various disciplines at universities has been studied by O. Kuzminska [12], I. Piankovska [13], N. Prykhodkina [14], I. Stoliarenko [15]. Although the flipped classroom has already been the subject of a number of studies by foreign and Ukrainian researchers, its potential in teaching ESP at university requires a deeper and more detailed investigation to enhance students' engagement and make ESP courses more appropriate to students' needs.

The article's goal is to analyse the experience of using the flipped classroom for teaching ESP at the National Aviation University, Ukraine, and prove its suitability to enhance the ESP teaching-learning process at technical university. In particular, we addressed the following tasks:

1) to determine the specifics of the flipped classroom in teaching ESP;

2) to correlate the main phases of the flipped classroom with the development of students' lower-order and higher-order thinking skills at each of them;

3) to select and classify a set of digital tools for learning ESP that can be recommended for out-of-class work to make learning more effective and engaging;

4) to reveal students' perception of the flipped classroom based on the the survey and identifity advantages and challenges of implementing the approach to teaching ESP.

2. THE THEORETICAL BACKGROUNDS

The flipped classroom as a model of blended learning is one of the latest trends in education. In Ukraine, it began to be implemented recently and is still under investigation. However, the concept of "flipped classroom" is not new: the term became widely used about 13 years ago when it was popularized by J. Bergmann and A. Sams and the founder of Khan Academy, S. Khan, and some of its principles had been applied by educators even earlier. Although there is no consensus on the concept of "flipped classroom" among researchers, who consider the term as a "technology", "method", "approach", "model" and "principle", all of them agree that in flipped learning "the activity which was traditionally done in a classroom is now done at home, and which was traditionally done as homework is now completed in a classroom" [5, p. 139]. In our study, the flipped classroom is considered as an approach to organizing learning, in which in-class work and out-of-class work are "inverted", so that students learn the theoretical material on their own before the class, and the classroom time is then used to deepen their comprehension of the material by discussing and solving the problem tasks. The flipped classroom provides considerable flexibility and engages students in the learning process, allows creating a dynamic and creative environment where students learn to think critically and solve problems together.

During traditional classes, when the teacher explains a new learning material, students perceive the material at the time of speaking. They do not have the opportunity to stop either to think over the information that has been given or to listen again if something is not clear, therefore they can miss important ideas [14, p. 142]. In addition, today's students − representatives of the digital generation −grow up with the Internet, YouTube, social media and have advanced computer skills, so they are interested in applying these skills to acquire new knowledge.

A distinctive feature of the flipped classroom is the full or partial transfer of the process of acquiring knowledge to self-study. At the same time, the freed up classroom time is used for interactive activities that develop students' critical thinking and creativity. Students come to class not to gain theoretical knowledge, but to demonstrate how to apply the acquired knowledge in practice [5, p. 13]. However, J. Bergmann and A. Sams note that there are certain topics in the syllabus that are better studied in the classroom [5, p. 13], i.e. the teacher must carefully select the method according to the content.

Although today there are several forms of flipped learning, they are all based on one main principle: critical discussions, practice and application are taking place in the classroom [12, p. 89]. Thus, students perform the tasks requiring more complex cognitive activities in the classroom under the teacher's control.

The analysis of the above-mentioned studies has allowed us to identify the following features of the flipped classroom which can be also attributed to teaching ESP:

The change in the traditional elements of classroom work and homework. In flipped learning, teachers provide students with information for self-study with the help of modern ICT tools instead of presenting theoretical material in the classroom. The discussion of the material takes place in the classroom, as well as the explanation of the most difficult points

and generalization of the previously learnt material. Therefore, students do more engaging activities in the classroom: the language is used more practically and acquired knowledge is consolidated through discussions, conversations, work in small groups, joint problem solving and performing a project. There is a gradual complication of the level of tasks and expansion of activities, providing feedback and activation of acquired knowledge. To stimulate students' out-of-class activities, learning has to be organized so that students are aware of the benefits of their self-study at home and use its results.

Flexibility. When working with educational material, students can choose the time, place and method convenient for them, working in asynchronous and individual modes [13, p. 55].

Individualization. Students have the opportunity to work at the comfortable pace stopping the recording or track, replaying it, and finding the required additional information or explanations on the Internet or in reference books. This is especially useful for students struggling to cope with their learning tasks. Thus, the problem of prior multi-level readiness can be partly solved.

Differentiation. The learning material is presented in different formats (text, audio, video) and forms (presentations, podcasts, videocasts, screencasts) to meet students' individual styles of learning (visuals, audials) [15, p. 140]. Compared to a whiteboard in the classroom, video lectures provide better visualization of the relationships between objects due to the wide use of graphics and animation. Video lectures are often considered as a key component of the flipped classroom and teachers can create their videos (e.g., by using the tools for creating video such as Screenr and Webinaria) or use the existing ones (YouTube, TED talks, etc).

Personalization. The flipped classroom promotes an intensive exchange of views and ideas between the teacher and students, encourages them to interact actively to achieve learning objectives and provides feedback between them [15, p. 140].

The shift in the role of the teacher and students. Flipped learning involves a change in the role of the teacher, who is transformed from the main translator of knowledge into the facilitator of students' activities, which contributes to the teacher's closer cooperation with students during learning and the development of certain competencies. A student's role alters as well: they are not passive recipients of the content any more, they are active agents, responsible for learning outcomes. This facilitates their further independence, develops the ability for self-study and professional self-improvement.

Change in the assessment. The flipped classroom changes the process of traditional assessment, based on the reproduction of knowledge and its application in a clearly defined academic situation. Flipped learning allows using a wider range of forms of the control of students' knowledge depending on the tasks they face.

The need to implement this technology when teaching ESP at the National Aviation University was dictated primarily by reducing classroom hours assigned to this discipline. With fewer classroom hours, the importance of students' self-study has increased, and the achievement of learning outcomes depends on the effectiveness of organizing self-study.

3. RESEARCH METHODS

During the study on the implementation of flipped classroom in teaching ESP, the following theoretical and empirical methods were used: *an analysis* of the available methodological and scientific literature to identify the state of the problem under investigation and determine the goals and tasks of the study; *diagnostic methods* (questionnaires, interviews with students and teachers), *scientific observation, methods of deduction and induction, systematization* and *generalization.*

The investigation was held at the National Aviation University (Kyiv, Ukraine) and enrolled 46 undergraduate students majoring in "Automation and Computer-Integrated Technologies" and the teaching staff of the Department of Foreign Languages and Applied Linguistics. The teachers faced the challenge of modernizing teaching and reorganizing students' learning to adapt them to the current conditions and the development of alternative forms of education. At first, a critical analysis of the system of organizing the learning process at the university was made and the international experience, modern trends in ESP teaching and requirements to higher education were studied. Under the given conditions, flipped learning was chosen from a variety of learning formats as the most appropriate one.

During the fall semester of 2019 and the beginning of the spring semester of 2020 (before the outbreak of coronavirus Covid-19), one group of the second-year students and two groups of the third-year students of the above-mentioned major participated in this study. From March to June 2020 there were some alterations because of Covid-19: in-class face-to-face meetings were converted into online sessions on Zoom and Google Meet platforms. The choice of the students of this major was predetermined by their computer literacy and developed skills in working with ICT, and the second and the third years of study implied a certain proficiency in ESP, formed during the previous years of learning at the university.

At the beginning of the fall semester, the ESP course was revised to incorporate the flipped classroom model. A significant part of the content was transformed into digital formats. Classroom meetings were mainly focused on higher-order thinking skills such as applying, analyzing, and creating.

The authors made class observations during the ESP course to evaluate students' motivation, their engagement in out-of-class and in-class activities and determine advantages, drawbacks and challenges of the flipped classroom. At the end of the academic year, a survey was held in the form of the questionnaire, where the students had to comment on whether they liked using flipped learning of ESP, what difficulties they had, etc. The results of the survey were analysed and are represented in the paper.

4. THE RESULTS AND DISCUSSION

4.1. The experience of implementing flipped classroom in teaching ESP

4.1.1. A revised Bloom taxonomy in the flipped classroom design

The flipped classroom takes a more intuitive approach to revised Bloom's taxonomy. It provides favourable conditions for students to perform more complex tasks in the classroom applying a higher level of cognitive activity due to accomplishing easier tasks at home before the class. Taking into account the revised version of Bloom's taxonomy represented in [16], which includes learning objectives depending on mental operations from the lowest to the highest level (*remembering, understanding, applying, analyzing, evaluating* and *creating*), we believe that the phases of flipped learning of ESP should be planned according to these levels, without skipping any of them.

Due to the lack of the classroom time, traditional ESP teaching rarely master students' ability to apply knowledge, which they have acquired in the classroom, in professional situations. The classes usually start with revising professional vocabulary (which unlike general English, is new and difficult for students), practicing grammar, developing reading and listening skills, so little time is left for improving higher-order thinking skills in the classroom. Less emphasis on such skills results in student's inability to apply knowledge they have acquired in the classroom outside the university. Therefore, new ways should be found to place more emphasis on improving higher-order thinking skills to promote cognitive skills such as critical reasoning skills and creative thinking.

In the hierarchical model for cognitive learning, Bloom singles out passive learning, such as acquiring knowledge (remembering) and understanding at a low level of cognitive activity, while more active learning, such as analyzing, evaluating and creating requires a high level of cognitive activity.

The first phase of pre-class work includes students' activities aimed at identifying and recalling from memory, mastering and understanding the learning material. During this period students develop the lower-order thinking skills of *remembering* and *understanding* on their own with the help of digital learning tools.

During a face-to-face meeting in the classroom, learning activities have to be organized to apply and analyze previously acquired knowledge (*applying and analyzing)*.

The post-class activities embrace the development of the students' ability to evaluate their achievements and perform more complex creative tasks (*evaluating and creating*).

After analyzing the content of the ESP syllabus for the students majoring in "Automation and Computer-Integrated Technologies", we have revealed that the main professional topics are "Hardware", "Software", "The Internet. The Internet of Things", "Cybersecurity", "Modern Technologies", "Robotics", "Artificial Intelligence", each of which include developing students' skills in all types of the foreign language activities (listening, reading, speaking and writing). The purpose of the course is to master ESP proficiency, which can provide communicative ability in professional and situational communication.

Taking into account the aforementioned points of implementing the flipped classroom, the specific activities for teaching ESP for these students were divided as follows:

1. *Pre-class work (self-study before the class)* included:
   - processing of the learning materials specified by the teacher (profession-oriented topics in English from online resources, including authentic articles, podcasts or videos, screencasts; the grammar video created by the teacher for the needs of the group or taken from the Internet);
   - performing comprehension tasks in the form of online tests, questionnaires, exercises, games (using Master Test, Online Test Pad, Google forms, Quizizz, Kahoot) and written assignments;
   - learning new professional vocabulary by using Quizlet or Memrise in different modes (flashcards, learn, write, match and test).

The students studied the theoretical material on their own. The main task of the teacher at this phase was to create and choose appropriate digital learning tools and materials (videos, audio recordings, podcasts, presentations), guidelines for students' self-study and means of monitoring students' progress. Students' self-study was organized for the following areas: vocabulary learning and practice (translation, selection of synonyms and antonyms, explanation, use in context, development of "mind maps", completing collective wordlists on the Google site); learning or revising grammar topics and the comprehension check with the help of reproductive exercises (substitution, transformation, matching, multiple-choice); doing tasks to check the comprehension of reading, listening or video watching. The activities of this phase resulted in developing lower-order thinking skills of remembering and understanding. A virtual learning environment helped the teacher track students' progress and plan further face-to-face activities based on it.

2. In-class work (active learning during face-to-face meetings) involved group discussions, dialogues, problem-solving, debates, practical tasks, role-plays and other kinds of interactive learning for actualizing and applying new knowledge. In the classroom, comprehension tasks were also used to monitor students' activity or to check how they have mastered the learning material at home, but these tasks were in the form of communication. More in-class time was used to focus on deepening students' knowledge and putting it into practice. The activities of this phase were aimed at applying the acquired knowledge and

analyzing. Doing the lower-levels cognitive work (knowledge acquisition) before class time, the students were able to focus on the higher-order thinking skills during class time, when they could take advantage of support from peers and the teacher.

3. *Post-class work* involved performing more difficult practical tasks to continue classroom activities, consolidate the topic and fulfil creative tasks. Sometimes these activities were used in the classroom. Post-class work had a creative nature: compiling a thematic glossary, preparing presentations, writing essays, abstracts, blogs, reviews, doing projects, etc. The teacher continued supporting students via asynchronous and synchronous communication. Each student could be evaluated not only by the teacher but also by other students in synchronous and asynchronous modes. This phase was characterized by independent generalization and reflection. The work that students did after the classroom activity was more flexible than in traditional learning. Teachers chose how their students would best retain acquired knowledge: students could be assigned to complete the activities they started in the classroom, practice them or extend the topic by completing the project, writing a blog, an essay, survey, review on the topic that had been studied.

4.1.2. Digital learning tools for teaching ESP

As the flipped classroom is becoming increasingly popular in teaching English, new digital learning tools are emerging to support out-of-class work. For instance, powerful mobile devices are being developed, having a wide range of convenient educational resources for students. More and more massive open online courses (MOOC) contain elements of the flipped classroom, which complete out-of-class work with video presentations and support project activities at traditional classes.

An important aspect of organizing the flipped classroom is the creation of a virtual learning environment. We chose Google Classroom to organise flipped learning of ESP. This learning management system (LMS) aims to simplify creating and delivering assignments to students, give efficient feedback as well as to engage students in learning.

The role and objectives of Google Classroom in flipped learning are as follows: to organize learning during the phases before and after the class, be an additional tool for face-to-face sessions, organize tests and other forms of controlling learning outcomes. This LMS can also be a hub for using other digital learning tools. Google Classroom is the platform where the interaction between the teacher and the student or the teacher and the group takes place. The teacher shares the content and the useful materials of the course, monitors and controls students' progress by implementing digital learning tools, especially content delivery tools, visualization tool and control tools. [17, p. 239].

At the beginning of the flipped classroom implementation, we had to consider how to transfer the traditional activities from the face-to-face session to independent out-of-class preparation. The most accessible ways to do this were to use learning videos on grammar, short videos on professional topics such as "Modern information technologies", "Biometrics", "Robotics", "Artificial intelligence", questions for reflection, online tests, teamwork, etc.

In terms of online interaction Google Classroom ensures the integrity of classroom and out-of-class work, realizes effective interaction of students in the real-time mode through commenting, publishing announcements, questions, information digests, gives the possibility to control the fulfilment of students' individual tasks in the classroom and out-of-class time, set deadlines for completing each task, evaluate students' academic achievements and create statistical reports [17, p. 239]. The work in a virtual classroom allowed giving students open access to learning materials; organizing their self-study and self-check; individualizing the learning process; increasing students' cognitive activity and motivation and developing their self-reflection skills. To achieve this goal, all phases of the flipped classroom had to be carefully planned.

We have selected the digital learning tools (applications, websites), which we used in teaching ESP in our flipped classroom and categorized them according to their purpose.

Table 1

Digital learning tools used in teaching ESP in the flipped classroom

Activities	Digital Learning Tools (Applications, Websites, Online Resources)
Vocabulary learning (wordlists, vocabulary games and practice)	– Quizlet – Memrise – WordUp
Comprehension check (quizzes, tests, multiple-choice questions, matching, open questions)	– Google forms – Quizizz – Kahoot – Edpuzzle – Wizerme – Classmaker – Nearpod
Pronunciation	– EnglishCentral – YouGlish (authentic pronunciation examples) – SpellUp
Speaking	– VoiceSpice – FlipGrid – Voki – VoiceThread – Speak and improve
Writing	– Blogger – Write and improve
The use of online resources representing authentic videos, articles and other learning materials	– ThoughtCo – Newsela (multilevel graded news articles with quizzes) – TED talks (authentic video) – BBC Learning English – Science News for Students

The first set of digital learning tools is designed for learning vocabulary. *Quizlet*, an educational application with a user-generated content, helped our students learn new professional vocabulary by using flashcards, memorizing lists of words, taking tests with written answers, spelling practices, matching and playing games. Students found it appealing and useful to prepare for a test or to practice a certain vocabulary. The advantage of this application for the teacher was in the opportunity to monitor students' progress. *Memrise* is a similar application for learning professional vocabulary. However, it was less popular among our students because of less diversity of tasks. *WordUp* was not used to learn the vocabulary of the specific topic but it was a useful additional tool to help students expand their vocabulary. One of its advantages is that it represents not only the translation and definition of the term but also its use in an authentic context (quotes, articles, songs, extracts from movies).

The second group of digital tools (Google forms, Kahoot, Edpuzzle, Quizizz, Wizerme, Nearpod, Classmaker) were used to check reading and listening comprehension and grammar. They became valuable tools for formative assessment that was extremely important in any classroom including the flipped one. As the flipped learning put more responsibility for learning on students, the formative assessment was required after every video or text material. Edpuzzle allowed embedding a variety of comments and test questions into videos and analyzing students' results. Quizizz, Kahoot and Wizer.me allowed creating gamified activities for the students or using the available engaging online worksheets: different types of quizzes of different types (open

answers, multiple-choice, matching, filling in the blanks, etc). Their advantage was that the students' answers could be automatically graded saving the teacher's time.

One more appealing learning tool we would like to recommend is Flipgrid. It is a website where our students could post video comments on specific topics of the module. A question was posted on the Google site or in Google classroom by the teacher with the embedded link to Flipgrid and students responded to it through a recorded video.

Thus, digital learning tools are a powerful factor in motivating students to learn ESP. They increase the relevance and novelty of the content of learning, since digital learning material can be constantly added and updated. Moreover, ICT meets the intellectual interests of modern students who like performing various tasks on smartphones and tablets [18, p. 98]. It was noticed that the students interacting with the teacher and other students via the Internet and having constant access to authentic materials in English while learning ESP, had gained a sense of freedom and pleasure from their self-study.

4.2. The Analysis of Survey Data

A survey was conducted two months before the end of the academic year. In addition, we conducted our observations during the whole academic year. The purpose of the survey was to collect students' responses to obtain the information about the ongoing implementation of flipped classroom model of teaching ESP to students majoring in "Automation and Computer-Integrated Technologies" and reveal their perceptions of the flipped classroom. For this purpose, we developed a questionnaire as the survey instrument to capture students' perceptions of such learning. It included thirty-four statements and four open-end questions to reveal students' positive attitude to the flipped classroom (questions 1-3, 5-7, 9-13, 17-22, 25-27, 29-30, 35), students' negative attitude to the flipped classroom (questions 28, 36), students' motivation and skills (questions 8, 14-16, 24, 31-34) and the difficulties students have during learning (questions 4, 23, 37). The participation in this survey was voluntary and the responses were anonymous. The questionnaire is represented in Table 2.

Table 2

Questionnaire "Your Attitude to Flipped Learning of ESP"

№	Statement	Yes	No	Not Sure
1.	I am satisfied with the use of the flipped classroom teaching model.			
2.	I am more motivated to learn ESP in the flipped classroom.			
3.	I like doing online tasks in this course.			
4.	I need more teacher's guidance for accomplishing online tasks.			
5.	Online material presentation (demonstrations, videos, reading materials, links to relevant websites) is very helpful.			
6.	I regularly use the online resources provided by the teacher.			
7.	I regularly watch the video assignment.			
8.	I am good at managing time and meet deadlines with my home assignments.			
9.	I like doing online tasks because I can go at my own pace.			
10.	I like the opportunity to go back to the video if I do not understand something. This greatly helps me get all of the notes at my own speed and go back to see a mistake I might have made in learning something.			
11.	I like the opportunity to complete home assignments anywhere / anytime.			
12.	I think that the use of Quizlet, Memrise simplifies learning new vocabulary, making it more efficient.			
13.	I feel more relaxed and confident when I can check myself by using digital learning tools.			
14.	I have a sense of achievement when I finish my tasks and I do not need any external forces (grades, praise or punishment) to make me do them.			
15.	I do my online tasks because they will facilitate my in-class activities and			

	can be checked by the teacher.			
16.	I do my online tasks only when I get a grade for them.			
17.	I like doing offline tasks of this course.			
18.	I think that in-class activities are well organized.			
19.	I am satisfied with my in-class and after-class performance in this course.			
20.	I like that the flipped classroom gives me more time to perform speaking activities in the classroom and improve my speaking skills.			
21.	I think that the flipped classroom gives me more in-class time to solve problem-based tasks.			
22.	I like that the flipped classroom gives me more opportunities to communicate with my groupmates in synchronous and asynchronous modes.			
23.	I need more teacher's guidance in offline practice.			
24.	I think that the tasks we are doing now improve my communication skills.			
25.	I think that the face-to-face sessions of this ESP course significantly reinforce what I am learning via the online components of this course.			
26.	I think that this course is more useful for me compared to my traditional face-to-face course.			
27.	I want to continue trying such learning of the ESP course next semester.			
28.	I like traditional classes more than flipped ones.			
29.	I think that the flipped classroom activities are more engaging than traditional classroom activities.			
30.	I think that flipped classroom has improved the way of my English learning.			
31.	I think that flipped classroom has improved my digital skills.			
32.	I think that flipped classroom has improved my time management skills.			
33.	I think that flipped classroom has improved my skills of independent learning.			
34.	I would recommend the flipped classroom to a friend.			
	Open-ended questions	**Your answer**		
35.	What do you like most about the flipped classroom?			
36.	What do you dislike most about the flipped classroom?			
37.	What difficulties do you have during the course?			
38.	What would you recommend to improve the ESP course?			

The results of the survey have shown that the majority of students consider flipped learning effective. Statements 1, 27 and 34 refer to students' attitude to the course. The number of students who chose "Yes" was overwhelmingly higher than the number of those who chose "Not sure" or "No" (76.1% "Yes", 15.2% "Not sure", 8.7% "No" for statement 1 and 73.9% "Yes", 17.4% "Not sure", 8.7% "No" for statement 34). "Yes" represented a strongly positive attitude, "Not sure"– a neutral attitude and "No"– a negative one. This indicates that the flipped classroom made the majority of students under investigation satisfied with the ESP course.

Statements 14, 15, 16 check students' motivation. Statements 15-16 refer to extrinsic motivation (doing an activity because of external rewards such as grades, praise, approval or punishment) and statement 14 checks intrinsic motivation (doing an activity because it is personally awarding, brings inherent satisfaction and self-improvement). The rates of extrinsic motivation were relatively high: 65.2% of respondents answered "Yes", 19.6% answered "Not sure" and 15.2% answered "No" for statement 15.

These results support L. Abeysekera and P. Dawson's point of view that "learning environments created by the flipped classroom approach satisfy students' need for autonomy and entice greater levels of extrinsic motivation" [19, p. 3]. The flipped classroom created an environment that made the student the centre of the learning process. The students had the opportunity to be in charge of the knowledge acquisition and its application as well as showing creativity through active participation.

However, the intrinsic motivation was still low according to the questionnaire. Only 26.1% of respondents answered "Yes" in statement 14, but 34.8% were "Not sure" and 39.1% chose "No". Besides, 23.9% of the respondents indicated that they "did online tasks only in the cases when they were checked and assessed" (statement 16). These results show these students are governed by external motives that can be related to their poor professional motivation, neutral attitude to learning and dependence on grades. But according to the observation during the course, we can admit that intrinsic motivation was also gradually increasing because the students were getting more engaged in the learning process. The flipped classroom creates learning environments that provide satisfaction of student needs for autonomy and competence; therefore, it facilitates and generates students' intrinsic motivation [19, p. 3]. The teacher should remember that students must find engagement in a given learning activity satisfying to experience intrinsic motivation. That is why the activities have to be novel, challenging and valuable for students.

The important task was to reveal how the flipped classroom approach influenced the development of students' transferable skills. For instance, 43.6% of the respondents noticed the improvement of digital skills while working with mobile applications and Google applications (statement 31), 28.3% confirmed the improvement of time management skills due to accomplishing online tasks (statement 32), 54.3% agreed that the flipped classroom developed their communicative competence (statement 24).

The responses to the open-ended question "What do you like most about the flipped classroom?" revealed the main advantages of its use from students' point of view. The most common responses were: learning at one's own pace; flexible schedule; the use of videos and the possibility to watch them again if something was forgotten; the availability of the learning material even if a student misses the class; interesting interactive tasks; taking online quizzes and tests for self-check; possibility to use the applications for learning even in transport; more free time for speaking in the classroom; the opportunity to do the pre-class tasks whenever a student wants; receiving feedback from the teacher in the form of comments and messages; the ability to apply the available IT skills in learning English; being more independent; access to authentic up-to-date materials; the relevance of the course content to students' needs; more interesting classes; the use of of up-to-date learning tools.

Among the main difficulties the students indicated: technical problems (poor Internet connection at home, some problems with laptops or other gadgets), insufficient development of digital skills (difficulties with learning applications at first, before understanding how they work, difficulties with signing in), poor motivation (difficulties in making themselves learn and doing all the required tasks at home, "If my task is not going to be checked and assessed by the teacher, I won't do it", "I have to spend much time for preparation but I have to prepare to other courses as well"), poor time management skills ("I often fail to submit the task on time", etc).

It was also important to understand what improvements the course required from the student's perspective. 63.04% claimed that they were satisfied with everything, others asked for more hours for learning the discipline in the classroom ("one class a week is not enough"), including more interactive tasks, trying another online platform for performing online tasks that incorporates all necessary learning tools in it without the need to sign in additionally to work with them, using this approach to studying other disciplines at the university, more use of popular applications like TikTok, etc.

Of course, the flipped classroom cannot be a universal solution for every course at university and for all teachers and students. However, its implementation in ESP teaching at university is very important, as it creates benefits for both teachers and students. Based on the results of the survey, let us highlight the main advantages of its use in teaching ESP at university.

One of the most important advantages is that its use increases students' motivation and interest in learning and encourages better processing of the material by using modern

technologies and interactive tasks. The use of digital learning tools to support students' self-study gives them the opportunity to write their comments and questions, increases their interest and improves feedback.

Another advantage of the flipped classroom is the improvement of the efficiency of face-to-face sessions in the classroom. Without the need to spend much time on explaining theoretical issues assigned for self-study, teachers use classroom time to perform practical tasks and reproduce real-life communicative situations, i.e. engaging and creative activities that include higher-order cognitive processes and require practical application of acquired knowledge. By observing classroom assignments and blog posts, the teacher has a better opportunity to analyze students' mistakes to further focus on specific issues and prevent them.

The main reasons why teachers choose the flipped classroom are as follows: a better learning experience for students, ICT accessibility, increasing students' activity in the classroom and beyond, increase in the number of discussions and better cooperation among students, personalization of learning, the possibility and convenience for struggling students and those who have missed a lesson to continue learning, development of practical skills, students' involvement and increase in the efficiency of learning. The use of a wider range of means of communication helps to attract and engage more students and activate students' self-study.

However, at first, the implementation of the flipped classroom technology may cause disapproval from both teachers and students, so this process should be introduced gradually. A serious obstacle for the technology integration is the significant time spent by the teacher to create a database of materials on educational Internet platforms and prepare the relevant materials, as well as insufficient knowledge of IT, inability to work with the required tools. There is also a need to create a system for monitoring and checking students' home assignment, but this drawback is overcome with modern distance learning resources, which allow the teacher to track students' performance of course assignments. Technical equipment can also be a problem. The restraining factor is quite a low level of intrinsic motivation and the general passivity of students. The problems of plagiarism and academic dishonesty should also be mentioned, which become especially acute in the context of virtual education. Thus, the organization of the flipped classroom is a complex process that requires much preparation and proper methodological support. Efficiency is achieved only due to careful planning of the content of the course, selection of teaching methods and the use of appropriate technical tools.

4. CONCLUSIONS AND PROSPECTS FOR FURTHER RESEARCH

The flipped classroom is one of the current trends able to increase the level of students' motivation and success in case of proper organization. Using it for teaching ESP to bachelors in automation and computer-integrated technologies allowed a transfer from passive to active learning, which results in improving English proficiency. The specific features of flipped learning are that it focuses on the effective use of time in the classroom, takes into account different categories of students and their styles of learning, allows students to take responsibility for learning, increases teacher-student interaction and changes the teacher's role from a translator to a facilitator. Student-centred learning is a basis of the effective flipped classroom with its three main phases. Such lower-order thinking skills as remembering and understanding can be developed independently during the pre-class phase. By purposely transferring some instructions online, more time in the classroom is dedicated to discussion, analysis, and application of the acquired knowledge, so this phase is characterized by developing the skills of applying and analyzing. It is followed by the development of the skills of evaluating and creating in the classroom or during the post-class phase. These higher-order thinking skills are often put aside during traditional classes because of time constraints.

The flipped classroom is organized by using digital learning tools for out-of-class activities during self-study. These tools have been classified in the paper by purpose: for learning vocabulary; checking reading or listening comprehension; improving listening, writing and speaking skills, etc. The recommended tools can be used by ESP teachers for organizing blended and distance learning. The survey has shown that the majority of students majoring in "Automation and Computer-integrated Technologies" (76.1%) consider flipped learning effective. Students' engagement in learning, increase in motivation and interest, learning at convenient pace, constant availability of the learning material, interesting interactive tasks, more time for developing communication skills in the classroom and increase in the efficiency of learning are only some advantages of the flipped classroom. However, the study has revealed some difficulties such as: technical problems, insufficient level of intrinsic motivation, organizational and time management skills. Even despite them the flipped classroom has a great potential for use in teaching ESP at university. In our future research we intend to determine the pedagogical conditions for developing students' foreign language communicative competence within the framework of the flipped classroom.

REFERENCES (TRANSLATED AND TRANSLITERATED)

[1] Ye. Isakova, K. Zubenko, N. Paziura, V. Olekhnovych, V. Ostashchuk, "A Computer Oriented Model of Blended Learning of the English Language", *Naukovyi Visnyk Natsionalnoho Hirnychoho Universytetu,* no. 3, pp. 122-130, 2020, doi: 10.33271/nvngu/2020-3/122 (in English).

[2] C. Scott, 'The futures of learning 2: What kind of learning for the 21st century?', *UNESCO Education, research and foresight: working papers,* no. 14, pp. 1-14, 2015. (in English).

[3] C. Howitt and M. Pegrum, "Implementing a flipped classroom approach in postgraduate education: An unexpected journey into pedagogical redesign", *Australasian Journal of Educational Technology,* vol. 31, no. 4, pp. 458-469, 2015. (in English).

[4] C. Herreid and N. Schiller, "Case Studies and the Flipped Classroom", *Journal of College Science Teaching,* vol. 42, no. 5, pp. 62-66, 2013. (in English).

[5] J. Bergmann and A. Sams, *Flip Your Classroom: Reach Every Student in Every Class Every Day.* Washington, DC: ISTE, 2012. (in English).

[6] B. O'Bannon, J. Lubke, J. Beard, and V. Britt, "Using Podcasts to Replace Lecture: Effects on Student Achievement", *Computers & Education,* vol. 57, no. *3,* pp. 1885-1892, 2011. Available: https://www.learntechlib.org/p/50784/. (in English).

[7] R. W. Jaster, "Student and Instructor Perceptions of a Flipped College Algebra Classroom", *International Journal of Teaching and Learning in Higher Education,* vol. 29, no. 1, pp. 1-16, 2017. (in English).

[8] J. W. Baker, "The "Classroom Flip": Using Web course Management Tools to Become the Guide by the Side", in *Selected papers from the 11th International Conference on College Teaching and Learning,* J.A. Chambers, Ed. 2000, pp. 9-17. (in English).

[9] C. Brame, "Flipping the Classroom", Vanderbilt University Center for Teaching. Available: https://cft.vanderbilt.edu/guides-sub-pages/flipping-the-classroom/. (in English).

[10] D. Berrett, "How 'Flipping' the Classroom can Improve the Traditional Lecture", The *Chronicle of Higher Education,* Feb. 19, 2012. Available: https://eric.ed.gov/?id=EJ987290. (in English).

[11] B. Tucker, "The Flipped Classroom", *Education Next,* vol. 12, no. 1, pp. 82-83, 2012. Available: http://educationnext.org/the-flipped-classroom/ (in English).

[12] O. Kuzminska, "Flipped Learning: Practical Aspects", *Information Technologies in Education,* no. 1 (26), pp. 86-98, 2016. (in Ukrainian).

[13] I. Piankovska, "Using Flipped Learning Technology in Teaching Lexical Management", *Scientific Proceedings of the National University of Ostroh Academy. Philology Series,* no. 60, pp. 52-56, 2016. (in Ukrainian).

[14] N. Prykhodkina, "Use of Flipped Learning in Professional Activity of Higher School Teachers", *Scientific Bulletin of Uzhhorod National University. Pedagogy. Social Work,* no. 30, pp. 141-144, 2014. (in Ukrainian).

[15] I. Stoliarenko, "Features of Organization of Blended Learning in Preparation of Future Teachers of Informatics", *Information Technologies in Education,* no. 24, pp. 138-147, 2015. (in Ukrainian).

[16] L. Anderson, D. Krathwohl, et al. *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives.* Boston, MA: Pearson Education Group, 2001. (in English).

[17] O. Bondarenko, S. Mantulenko, A. Pikilniak, "Google Classroom as a Tool of Support of Blended Learning for Geography Students", *Pedagogy of Secondary and Higher Schools*, no. 51, pp. 235-246, 2018, doi: 10.31812/pedag.v51i0.3671. (in English).
[18] E. Akilli, L. Konoplianyk and Yu. Pryshupa, "ICT in Teaching ESP to Future Civil Engineers at Technical University", *Advanced Education*, no. 11, pp. 93-99, 2019, doi: 10.20535/2410-8286.148507. (in English).
[19] L. Abeysekera and P. Dawson, "Motivation and cognitive load in the flipped classroom: definition, rationale and a call for research", *Higher Education Research and Development*, vol. 34, issue 1, 2015, pp. 1-14, doi: 10.1080/07294360.2014.934336. (in English).

Text of the article was accepted by Editorial Team 20.09.2020

ВПРОВАДЖЕННЯ ТЕХНОЛОГІЇ «ПЕРЕВЕРНУТОГО КЛАСУ» НА ПРИКЛАДІ НАВЧАННЯ ФАХОВОЇ АНГЛІЙСЬКОЇ МОВИ БАКАЛАВРІВ З АВТОМАТИЗАЦІЇ ТА КОМП'ЮТЕРНО-ІНТЕГРОВАНИХ ТЕХНОЛОГІЙ

Конопляник Леся Миколаївна
кандидат педагогічних наук, доцент, доцентка кафедри іноземних мов та прикладної лінгвістики
Національний авіаційний університет, м. Київ
ORCID ID 0000-0002-3244-1965
lesia.konoplianyk@npp.nau.edu.ua

Мельникова Катерина Сергіївна
викладачка кафедри англійської філології і перекладу
Національний авіаційний університет, м. Київ
ORCID ID 0000-0002-8857-1830
kateryna.melnykova@npp.nau.edu.ua

Пришупа Юлія Юріївна
кандидат педагогічних наук, доцентка кафедри іноземних мов та прикладної лінгвістики
Національний авіаційний університет, м. Київ
ORCID ID 0000-0002-5617-4152
yuliia.pryshupa@npp.nau.edu.ua

Анотація. У статті писанодосвід використання моделі «перевернутого класу» при викладанні фахової англійської мови. У дослідженні, яке проводилось у Національному авіаційному університеті, взяли участь 46 студентів спеціальності «Автоматизація та комп'ютерно-інтегровані технології». Навчання в аудиторії відбувалось за розкладом, а позааудиторна робота проводилась за допомогою Google Classroom та набору цифрових навчальних інструментів. Наші спостереження під час викладання, їх подальший аналіз та розроблена анкета для студентів були використані для виявлення переваг та недоліків «перевернутого классу». Аналіз відповідей студентів показав, що таке навчання дозволяє їм навчатись у власному темпі, розвивати свої організаційні та комунікативні навички, уміння планувати час, підвищувати свою самостійність та творчість. У статті визначено три основні етапи використання моделі «перевернутого классу» та навички, які розвиваються на кожному з них. Запам'ятовування та розуміння відбувається на першому етапі, а звільнений аудиторний час присвячується формуванню навичок застосування та аналізу. Оцінка та креативність, які передбачають високий рівень пізнавальної діяльності, формуються на третьому етапі як в аудиторії, так і позааудиторній роботі. Автори систематизували цифрові навчальні інструменти для вивчення фахової англійської мови в позааудиторний час, використання яких сприятиме підвищенню інтересу студентів до навчання, перенесенню акценту під час навчання з викладача на студента та зробить курс відповідним до потреб студентів. Наприкінці навчального року було проведено опитування студентів, і аналіз їх відповідей показав, що вони позитивно сприйняли впровадження моделі «перевернутого классу». Як показали результати дослідження, використання «перевернутого классу» у викладанні фахової англійської мови є ефективним, оскільки економить аудиторний час на вирішення проблемних та комунікативних завдань, що сприяє розвитку навичок мислення вищого рівня, об'єднує аудиторне та позааудиторне навчання, контролює досягнення студентів не лише в аудиторії, але і поза нею, і робить навчальний процес більш цікавим та ефективним.

Ключові слова: «перевернутий клас»; перевернуте навчання; фахова англійська мова; цифрові навчальні інструменти.

ВНЕДРЕНИЕ ТЕХНОЛОГИИ «ПЕРЕВЕРНУТОГО КЛАССА» НА ПРИМЕРЕ ОБУЧЕНИЯ ПРОФЕССИОНАЛЬНОМУ АНГЛИЙСКОМУ ЯЗЫКУ БАКАЛАВРОВ ПО АВТОМАТИЗАЦИИ И КОМПЬЮТЕРНО-ИНТЕГРИРОВАННЫМ ТЕХНОЛОГИЯМ

Конопляник Леся Николаевна
кандидат педагогических наук, доцент, доцент кафедры иностранных языков и прикладной лингвистики
Национальный авиационный университет, г. Киев
ORCID ID 0000-0002-3244-1965
lesia.konoplianyk@npp.nau.edu.ua

Мельникова Екатерина Сергеевна
преподаватель кафедры английской филологии и перевода
Национальный авиационный университет, г. Киев
ORCID ID 0000-0002-8857-1830
kateryna.melnykova@npp.nau.edu.ua

Пришупа Юлия Юрьевна
кандидат педагогических наук, доцент кафедры иностранных языков и прикладной лингвистики
Национальный авиационный университет, г. Киев
ORCID ID 0000-0002-5617-4152
yuliia.pryshupa@npp.nau.edu.ua

Аннотация. В статье представлен опыт использования модели «перевернутого класса» при преподавании профессионального английского языка. В исследовании, которое проводилось в Национальном авиационном университете, приняли участие 46 студентов специальности «Автоматизация и компьютерно-интегрированные технологии». Обучение в аудитории происходило по расписанию, а внеаудиторная работа проводилась с помощью Google Classroom и набора цифровых обучающих инструментов. Наши наблюдения во время преподавания, их последующий анализ и разработанная анкета для студентов были использованы для выявления преимуществ и недостатков модели «перевернутого класса». Анализ ответов студентов показал, что такое обучение позволяет им учиться в собственном темпе, развивать свои организационные и коммуникативные навыки, умение планировать время, повышать свою самостоятельность и креативность. В статье определены три основных этапа внедрения модели «перевернутого класса» и указано, какие навыки развиваются на каждом из них. Запоминание и понимание происходят на первом этапе, а аудиторное время, которое освободилось, посвящается формированию навыков применения знаний и анализа. Оценка и креативность, требующие высокого уровня познавательной деятельности, формируются как в аудитории, так и в внеаудиторное время. Авторы систематизировали цифровые учебные инструменты для изучения профессионального английского языка, использование которых будет способствовать большему привлечению студентов к обучению, переносу акцента во время обучения с преподавателя на студента и сделает курс соответствующим потребностям студентов. В конце учебного года был проведен опрос студентов, и анализ их ответов показал положительное восприятие «перевернутого класса». Как показали результаты исследования, использование «перевернутого класса» в преподавании профессионального английского языка является эффективным, поскольку экономит аудиторное время для решения проблемных и коммуникативных задач, способствующих развитию навыков мышления высшего уровня, объединяет аудиторное и внеаудиторное обучение, контролирует достижения студентов не только в аудитории, но и вне ее и делает учебный процесс более интересным и эффективным.

Ключевые слова: «перевернутый класс»; перевернутое обучение; профессиональный английский язык; цифровые учебные инструменты.

This work is licensed under Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.