

# Learning Environment Design for Teaching Foreign Languages by Means of Instrumental Pedagogical Technologies

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**Abstract:** The paper reveals the content of the research aimed at studying the possibilities of computer-oriented technologies in the intensification of teaching foreign languages to students of non-linguistic specialties. The content of pedagogical foreign language learning technologies has been characterized; their classification has been carried out. The role, place and advantages of instrumental technologies in teaching methods update of a foreign language in the digital society have been shown. The main types of instrumental technologies that allow to increase the efficiency of teaching foreign languages have been identified, among them the following ones have been mentioned: technologies of technical teaching aids application, computer learning technologies, telecommunication technologies, and hybrid model of instrumental technologies. The leading part of ergonomic principles and methods for designing a learning environment that provides the most optimal ratio of modern digital and traditional intensive technologies for learning foreign languages have been emphasized. The criteria have been formulated, the methodology for diagnosing the level of ergonomics of the educational environment using the method of expert assessments has been disclosed. The positive dynamics in the level of ergonomics of the educational environment, which is designed on the basis of the use of instrumental technologies for teaching foreign languages, has been shown. The conclusions regarding the effectiveness of methodological approaches to designing an ergonomic educational environment using instrumental technologies for teaching a foreign language have been formulated.


## 1 INTRODUCTION


In connection with Ukraine entry into the European educational space, European integration, internationalization of business relations and professional activity, the problem of personal development and professional success is singled out, which today is undoubtedly associated with fluency in foreign languages, learning intercultural communication through the latest technologies.


In the context of modern educational concepts, in terms of democratization of society and socio-economic reforms in Ukraine, higher education is based on the principles of fundamentalization, systematization and humanization of knowledge, competency and cultural approaches and involves social determination of target guidelines. The dominant place among the educational goals belongs to the creation of conditions for the formation of personal qualities of students, in particular communicative, as well as traits mediated by the level of their foreign language communicative competence – ability to academic mobility, autonomous learning and lifelong learning.


Meanwhile, taking into account the specifics of teaching foreign languages to students of non-language specialties and the uniqueness of the cur-

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rent stage of development of digital and globalized society, a number of unresolved *contradictions* still remain. They are, in particular, between the urgent needs of society for professionals capable of intercultural foreign language professional communication, the growing amount of professionally oriented information in foreign languages and the possibilities of educational systems, limited time and extensive type of foreign language training of students in institutions of higher education.

The *purpose* of the paper is to research the possibilities of computer-based technologies in teaching foreign languages to students of non-linguistic specialties and ergonomic foundations in the design of the appropriate educational environment with the use of these technologies. The authors are going to reveal the classification of pedagogical technologies for teaching foreign languages, among them they will focus on characteristics and types of instrumental technologies applying for goals of intensification of teaching students of non-linguistic specialties. Yet another task of the paper is producing the sense of ergonomic analysis, as well as the methods of its use to design an environment for teaching foreign languages. In addition, the criteria and diagnostic tools for evaluation of designing the educational environment for learning foreign languages will be illustrated and clarified; the results of their approbation in real educational process will be shown and analyzed.

## 2 MATERIALS AND METHODS

The experience of studying foreign languages for special purposes in non-language institutions of higher education contains a lot of thorough work on the use of modern methods, forms, techniques of activating the educational process, increasing its efficiency. Thus, the theory and methodology of communication in a foreign language are disclosed in (Bartosh et al., 2020; Lyakhovitsky and Koshman, 1981; Nikolaeva and Synekop, 2020; Tarnopolsky et al., 2020; Zimnyaya, 2021); problems of students' foreign language communicative competence and foreign language culture formation – in (Amelina et al., 2022; Bondar et al., 2022; Buzhykov and Buzhykova, 2020; Chorna et al., 2022; Holiver et al., 2020; Kravtsova et al., 2022; Tokarieva et al., 2021).

The results of leading scientists and teachers-practitioners work analysis show that the reduction of the volume of foreign language learning in non-language institutions of higher education to a critical value has led to the loss of its effectiveness. This primarily influences the level of competitiveness of

graduates, reduces academic and professional mobility, the inability of most bachelors to continue their studies at the next level of higher education. That is why in the scientific literature there are more and more works on the conceptualization of empirical developments in the application of the latest pedagogical technologies that are able to ensure the process of intensive learning of foreign languages by students of non-language specialties (Bespalko, 1960; Klarin, 2016; Strelnikov, 2002), in particular, using digital technologies (Burov and Pinchuk, 2021; Buzhykov, 2006; Bykov and Shyshkina, 2018; Gurevich et al., 2016; Hodovaniuk et al., 2022; Kramarenko et al., 2022; Kukharensko, 2017; Tkachuk et al., 2019).

The works of researchers on the theoretical substantiation of methodological bases, genesis and experience of pedagogical technologies application (Driscoll, 2002; Lynch, 1996; Molnar, 1997; Negoescu and Bostina-Bratu, 2016; Skinner, 1931; Stanford, 2009; Thorndike, 1932) also make an important basis for scientific research; as well as their adaptation to modern conditions and development on this basis of new pedagogical technologies for teaching foreign languages (Lozynska et al., 2021; Rozhkova, 2014; Serdyukov, 1997).

Researchers also constantly emphasize the need for qualitative changes in the methodology of teaching foreign languages. In particular, it means the transition from extensive to intensive studying, in so far as in the process of extensive studying the capabilities of the brain are used by only 15–20%. At the same time, methods based on intensive teaching require excessive expenditure of mental energy. Thus, the discrepancy between the modern requirements of the digital society to improve the efficiency of learning and the shortcomings of modern methods of knowledge mastering raise the problem of developing such educational systems, which would be commensurate with the intensive work of lecturers, but without their excessive workload. These and other related issues are taken care of by pedagogical ergonomics, taking into account the achievements of which provides an opportunity to significantly increase the effectiveness of pedagogical technologies for teaching foreign languages (Gervas, 2011; Karapuzova et al., 2012; Lavrentieva, 2019; Okulova, 2011; Skydan, 1999).

Pedagogical ergonomics as a scientific discipline arose on the basis of ergonomics, the subject of which is a specific human activity (group of people) using machines (technical means) (Gervas, 2011, p. 3–4). Ergonomic analysis of the learning environment involves the movement in two directions – from human requirements to technical means of learning and the conditions of their optimal use, and vice versa –

from the requirements of technology and conditions of its operation to a human. Our special attention is drawn to such a direction as cognitive ergonomics, which was started and is developing in connection with the development and improvement of computer technology. Cognitive ergonomics takes care of the levels of interaction in the human-machine system – from physical interaction (angle, focus, colour perception, background, animation) to abstract (lexical, syntactic, semantic and conceptual levels), which are worth noting in the context of efficiency teaching foreign languages to students using pedagogical technologies (Gervas, 2011).

The basis of pedagogical ergonomics is a set of achievements of the complex of sciences in pedagogical work and student activities, educational environment and advanced pedagogical experience, modern technical means and pedagogical technologies used in the educational process. In this case, any phenomenon that occurs in the educational process has its meaning and is assessed through the functional structure of the system “educator – student – learning environment” (Skydan, 1999, p. 12).

Therefore, the above overview of modern foreign language learning technologies allows us to focus on the study of such issues as: classification of existing pedagogical foreign language learning technologies, the role, place and importance of instrumental technologies updated in the digital society, as well as ergonomic principles and methods of designing a learning environment that provides the most optimal ratio of modern digital and traditional intensive technologies for learning foreign languages.

### 3 THEORETICAL BACKGROUND

Content development research of “pedagogical technologies” concept by many researchers (Daniushenkov, 1994; Esnault, 2007; Guerrero, 2005; Petersson et al., 2007; Polat, 2004) singled out its long evolution. The genesis of pedagogical technologies can be found in technical teaching aids. For the first time the principle of manufacturability was formulated by Thorndike (Thorndike, 1932). The scientist noted that first there is a machine that can provide certain sensorimotor stimuli, then it is introduced into the educational process as a didactic tool and finally create a technological scheme of application (Thorndike, 1932). However, the mechanism of technologicalization of the educational process – its construction with rigidly planned, fixed results, was outlined by Skinner (Skinner, 1931) in the concept of programmed instruction (Young, 1961). Thus, the

level of implementation of pedagogical technologies in the educational process is subject to the vector of pedagogical systems development, is determined by the type of social thinking and is associated with scientific and technological progress of society and the introduction of new techniques.

In general, the development of the technological approach can be outlined by the following scheme: from the use of technical teaching aids and on their basis technologies in education to educational technologies and finally to the actual pedagogical learning technologies, when the educational process is based on the principles of systematization, scientificity, structure and procedurality.

It is established that the modern theory and practice of introduction of the technological approach in training offers numerous interpretations.

The conducted semantic analysis allowed to find out that *pedagogical technology* is a system category, which functions autonomously at three semantic levels (scientific, procedural-descriptive and procedural-activity), at the same time is in systemic interrelations and takes its place in the hierarchy of educational, upbringing and didactic technologies. Pedagogical technology is not identical to the type, method, teaching methods, didactic model and the methodology itself (Kuts, 2021).

We consider *pedagogical technologies of teaching* as types of concepts from generic “pedagogical technologies” and consider them as being based on modern positions of professional development of the person and directed on achievement of the educational purposes. In the process of learning foreign languages, such technologies are a way of step-by-step system organization of communicative interaction between lecturer and student in terms of prompt feedback between them through the use of specific methods, forms and means of learning. The leading class of pedagogical technologies for teaching foreign languages is communicatively oriented technologies.

The conceptual basis of pedagogical technologies of teaching foreign languages is the communicative-activity approach; leading idea – modelling a real foreign language professionally oriented communication in the educational process, principles – speech orientation, individualization and the primary role of the personal aspect, situationality and novelty, professionalization.

Approach systematization for the content problem in pedagogical technologies of teaching foreign languages made it possible to develop their classification based on different methodological principles (figure 1).

A special place among the variety of pedagogical



Figure 1: Classification of pedagogical technologies for teaching foreign languages.

technologies of foreign language teaching belongs to instrumental technologies. Next, we proceed directly to the analysis of their content and role in the intensification of the educational process.

## 4 ERGONOMIC BASES OF USING INSTRUMENTAL TECHNOLOGIES FOR DESIGNING EDUCATIONAL ENVIRONMENT FOR LEARNING FOREIGN LANGUAGES

### 4.1 Characteristics of Instrumental Technologies of Foreign Language Teaching

Technological approach to creating an artificial foreign language environment is one of the important issues of modern methods of teaching foreign languages. As a retrospective analysis of existing concepts shows, scholars and educators are constantly looking for tools that intensify the process of learning foreign languages.

Thus, *instrumental technologies of foreign language teaching* are considered as a process of development and application of special teaching aids, which is based on the language training method and is aimed at achieving educational goals.

Depending on the didactic purpose of instrumental technologies of foreign language teaching can be used as: sources of foreign language knowledge, means of organizing their learning under the guidance of a teacher or independently, means of visualization, practice, repetition and systematization of foreign language knowledge for all types of speech activity.

Based on the research of Serdyukov (Serdyukov, 1997), we include in instrumental technologies such interdependent components as:

- 1) technologies of technical teaching aids application;
- 2) computer learning technologies;
- 3) telecommunication technologies based on the use of telecommunication tools and networks.

Our vision of the types of instrumental technologies of foreign language teaching is presented in figure 2.

Considering the first component – the technology of modern technical teaching aids application, we should note the following. Despite the fact that

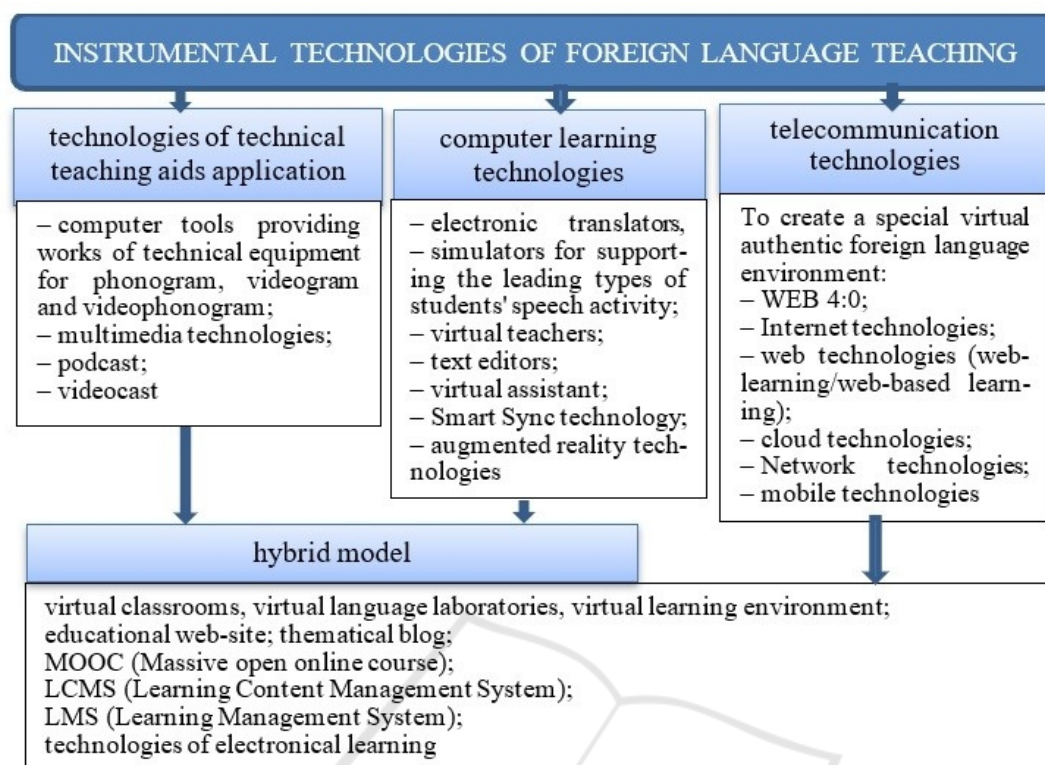


Figure 2: Family of instrumental technologies for teaching foreign languages.

modern technical teaching aids are almost entirely digital technical devices, the technologies of their application are based on the approaches developed by Lyakhovitsky and Koshman (Lyakhovitsky and Koshman, 1981). They names teaching aids in foreign language learning as a technical means that requires the use of technical equipment for phonogram, videogram and videophonogram (Lyakhovitsky and Koshman, 1981, p. 60). This generally accepted of technical teaching aids classification reflects the main means of supporting the leading types of students' speech activity.

*Auditory technical teaching aids* are used to teach listening, speaking through the use of speech patterns (emphasis, pronunciation, intonation); rational presentation of speech samples and their consolidation (for example; models, clichés, typical structures); introduction of speech material in dialogic form; demonstration of songs, folklore and artistic reading performed by native speakers; analysis of audio recording of students' statements; sound accompaniment of visual aids. In this way, audio technical teaching aids allow clarity for all types of sound and the presentation of educational information in natural language form (Rozhkova, 2014). The work, depending on the didactic goals, can be organized according to

one of the following three basic schemes: audiopassive, audioactive or audiocomparative (Lyakhovitsky and Koshman, 1981, p. 55).

The value of *on-screen videograms* lies in visual support, which increases the emotional perception of students of educational information and helps to focus and concentrate their attention on the objects of study. In addition, on-screen tools allow students to practice their reading and translation skills. As screen tools in the study of a foreign language can be used: illustrations of local lore and special professional material, authentic texts, various tables, schemes for studying grammatical material, etc.

*Dynamic means of visualization*, in comparison with static ones, allow to stimulate students' creative thinking. Sensory images, which consistently change and clearly reflect the logic of mental actions, facilitate the assimilation of all phases of educational material, contribute to the transformation of involuntary attention into a stable and consciously controlled one (Prykhodko et al., 2019). Dynamic screen tools include slide shows, which, with the correct didactic design, serve as a kind of screen story, which involves the plot organization of the material. For slides with pictures, you can select or use ready-made subtitles, questions and answers according to the logic

of learning the material. The image should appear on the screen only when it requires methodical design. This contributes to the maximum correspondence between the story and the visual image. Individual phases demonstration of dynamic processes development allows teachers, based on the imagination of students, to use their ability to think out on intermediate stages. This approach in the study of foreign languages stimulates interest, increases attention, helps to find logical connections in the material, to learn dialogic units (Rozhkova, 1987).

*Screen technical teaching aids, videograms* provide, first of all, the supply and processing of visual information, which during training can perform a variety of functions: 1) to serve as a support for understanding the language structure; 2) combine the semantic and sound side of the word and thus facilitate memorization; 3) to model language, speech situations; 4) perform the role of feedback in the form of keys to tests, tasks (Rozhkova, 1987, p. 46).

*Slideshows* with sound accompany combine two main means of creating a situation – an image and a word, they are characterized by flexibility and mobility. Soundtrack is the standard on which students adjust their speech. At the same time, it is a kind of key or control text with which the answer can be correlated. This function is implemented by fragments that include tasks based on the visual series, drawings (Rozhkova, 1987, p. 58).

Today's technical teaching aids are developed and applied on the basis of computer technology. To use them effectively, integrated computer-based technologies are being developed that significantly intensify foreign language learning. In particular, these are technologies of *podcast* (audio material) and *videocast* (video material), which the author sends by subscription via the Internet, as well as hub technologies.

With the development of equipment and related technologies, it became possible to create fundamentally new *technical teaching aids* – multimedia ones in foreign languages. Their valuable characteristic is the high quality of reproduction of all constituents of its data components, as well as the possibility of their interdependent or complementary use. For example, a combination of video with text and sound; audio fragments with text data on the content of the audio series; images with music and text. The minimal set of multimedia system in addition to the multimedia projector, equipped with a video camera, microphone, headphones, pedagogical software – performs in full the functions of language equipment. In this case, the possibility of manipulating information (stop-frame, repetition, increase-decrease, transfer, etc.) allows teachers to organize learning at the pace necessary

for students and at a level accessible to them (Molnar, 1997). Modern computer-based *technical teaching aids* also helps to master foreign language writing, grammar and spelling skills with automatic control by special programs (Polat, 2009).

Didactically correct use of modern *computer-based technical teaching aids* allows intensification of foreign language learning due to the maximum load of students' language and auditory channels, activation of their mental and speech activities, optimization of knowledge of special professional, intercultural and foreign language phenomena (Buzhykov, 2006).

A special class of tool technologies are Internet, web (web-learning/web-based learning) and cloud technologies. Their significance lies in the ability to use online services for learning a foreign language and work with authentic materials of cultural and scientific kinds. Pedagogical technologies in teaching, built on foreign language Internet information, contribute to the most effective formation of students of all types of foreign language communicative competence, allow to use language as a means of real communication. In addition, the information competence of students, the ability to organize communication by interests in oral and written forms is further developed. It is clear that working with authentic sources involves the level of formation of foreign language communicative competence of students is not below average. At the same time, lecturers are required to be able to organize such activities of students on a technological basis (Tkachuk et al., 2019).

It seems impossible to ignore the growing prevalence of computer-based foreign language teaching technologies, which allow to form all aspects of foreign language communicative competence. Among them are the following: electronic translators (including network), simulators for learning vocabulary, training of pronunciation, writing and speaking; virtual teachers, interlocutors and assistants; text editors with built-in checking and proofing tools and much more with the use of virtual and augmented reality. Smart Sync technologies provide students with quick access to up-to-date educational information under the guidance of lecturers.

Today, the computer in teaching foreign languages is also a technical means of interpersonal communication based on multifunctional network multimedia learning systems and automated learning systems – *telecommunications technology* (Buzhykov and Buzhykova, 2020), which creates a special virtual authentic foreign language environment.

Varieties of instrumental technologies can be used both separately and in combination, simultaneously

or sequentially combining different technical, educational, developmental and upbringing capabilities during the performance of pre-explanation exercises by students during explanation, training, repetition and consolidation of educational material. Modern computer-based *teaching aids* are fully capable of compensating for and modelling the natural foreign language environment for individual and differentiated foreign language learning according to academic achievement and the level of cognitive interest and professional needs of students.

Given the characteristics of the above subspecies of instrumental technology, Serdyukov (Serdyukov, 1997) quite rightly identifies areas of their application, in particular: technologies for the application of modern *teaching aids* are appropriate in the educational process with a group form of education under the guidance of a teacher; computer technologies – mostly in the organization of independent work and self-education, but also in the system of group classroom learning; telecommunication technologies – mainly in individual training, extracurricular activities and self-education. Computer technology can also be used autonomously and over a network (such as on-line services or cloud and Smart Sync technologies, LMS, LCMS, Web 4.0, MOOC).

The widespread use of modern digital technologies contributes to the emergence of *hybrid models* of instrumental technology for teaching foreign languages. Technologies of electronic learning are in their heart.

Let us consider further how the educational environment which allows effective use of pedagogical technologies of foreign languages teaching should be designed.

## 4.2 Ergonomic Approach to Intensify Foreign Language Teaching

First of all, we should note that *pedagogical ergonomics* is the direction of modern pedagogy, which aims to comprehensively study and design the pedagogical activities of lecturers and students in the system “educator – student – learning environment” to ensure its effectiveness and optimality. The most essential feature of pedagogical ergonomics is the consideration of phenomena in the relationship of the human factor with the factors of the learning environment (Gervas, 2011, p. 22–23). At the same time, pedagogical ergonomics is able to design appropriate options for specific activities related to the use of new technology; to formulate requirements to technical teaching aids, to a level of readiness of teachers and students concerning use of instrumental pedagogical

technologies of training, means of intensification of educational process in general (Karapuzova et al., 2012).

This becomes possible due to the fact that from the standpoint of pedagogical ergonomics a lecturer and a student are considered as carriers of activity, and the learning environment as one that ensures the integration of teaching and learning by the most optimal consideration of sanitary, psychophysiological, aesthetic and socio-psychological factors (Skydan, 1999, p. 11–12). The learning environment is interpreted in two ways: as an *external physical environment* that surrounds the subjects of educational activities and provides external information processes, as well as an *internal environment*, which initiates internal information processes, affects the inner world and thus enables educational and developmental impact on students and faculty. External information processes characterize the relationship between lecturer and student with sources of information, in particular with help of digital technologies. Internal information processes determine the psychophysiological side of studying – the proper course of the processes of perception, information processing and storage, knowledge and skills formation. Therefore, the effectiveness of application of pedagogical technologies of foreign language teaching depends on the appropriate design of the learning environment, where the activities of teaching and studying take place in externally and internally plan. This requires taking into account the production, sanitary, anthropometric, psychophysiological and aesthetic factors of study work, which is organized using pedagogical technologies of foreign language teaching (Gervas, 2011) (figure 3).

The means of pedagogical ergonomics make it possible to determine the appropriate relationship between “traditional” methods and teaching foreign language and computer-oriented instrumental technologies. In particular, pedagogical leaning technologies, introduced from ergonomic positions, take into account the motives, temperament, employment of students, allow students with special needs to study, activate students’ perception of information, increase their emotional tone. Pedagogical teaching technologies, based on pedagogical ergonomics, improve the quality of work through the possibility of proper distribution of time, transfer of routine functions to instrumental technologies, promote the stability of working postures and rational movements, prevent overload, including the language apparatus of foreign language teachers.

The technologies of partnership interaction in the system “lecturer – student – group”, based on the principles of ergonomic approach, provide the opti-

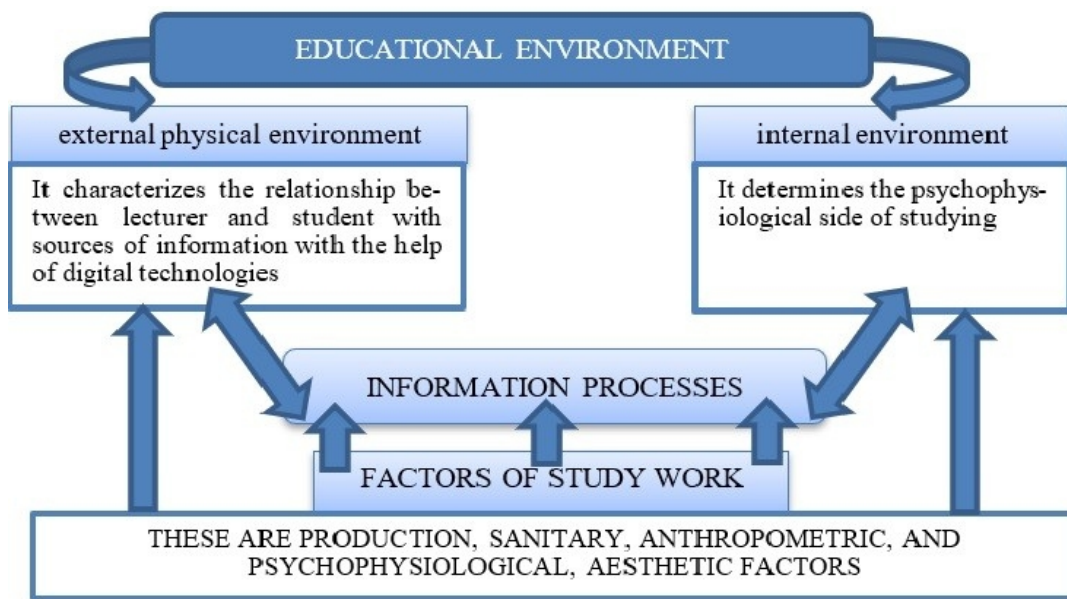


Figure 3: Ergonomic characteristics of educational environment.

mal way to organize educational activities, intensify it, but at the same time prevent fatigue by setting a certain pace, rhythm of educational work and proper feedback. Taking into account the requirements of ergonomics when using instrumental technologies is a guarantee of convenience, reliability and safe use of equipment in the educational process, reducing the intensity of educational work. Didactically correct use of instrumental technologies allows intensification of foreign language learning due to the maximum load of the language and auditory channels of learners, activation of their mental and speech activity, optimization of knowledge of intercultural and foreign language phenomena (Lavrentieva, 2019).

Designing the learning environment from the standpoint of pedagogical ergonomics requires the construction of a special language environment for students. Continuing the traditions of pedagogical ergonomics and didactics, we distinguish *two types of learning environment – material and virtual*. The subject-material part of the learning environment of foreign languages consists of: classrooms, language laboratories and students' workplaces, where educational equipment is located, teaching aids, multimedia equipment, mobile interactive devices, etc., as well as virtual laboratories created by modern platforms for remote teaching students using computer and network technologies (Skydan, 1999). It is pedagogical ergonomics that makes it possible to take into account the physical characteristics of sources of foreign language knowledge and the psychological features of their assimilation by means of pedagogical learning

technologies.

### 4.3 Methods of Designing an Ergonomic Environment for Teaching Foreign Languages

We proceed from the fact that the design in terms of pedagogical ergonomics affects the organization of teachers and students in a specially created language laboratory – directly in a classroom and in a virtual laboratory.

Today, the concept of “foreign language classroom” is a special audience (class), equipped with a set of sound, projection and film projection equipment, which allows audio-visual methods to create optimal conditions for students' independent work to master non-native language skills, native language speech culture and professional – performing skills in students' specialty (Lozynska et al., 2021).

Under ergonomic requirements, the working space of students, teachers and groups in the classroom in general should be designed for a certain number of study seats (from 10 to 25), and so that each lesson can be organized both individually and in a group, and change forms of work would not cause overload, delays, inconveniences, unnecessary movements of both teachers and students.

We have taken into account that the widespread use of multimedia teaching aids and instrumental technologies based on them makes it possible to properly design the workspace of foreign language



teaching in the language laboratory so as to achieve the required level of functional comfort for lecturers and students. Multimedia technologies organize the teaching of foreign languages on the basis of psychologically correct modes of functioning of attention, memory, mental activity of students, reconstruct the learning process from the standpoint of integrity. In particular, they allow to take into account the physiological basis of information perception, to provide the appropriate angle, focusing students' eyes, based on psychological features in the perception of colour, background, the rate of change of information flow for the person working.

As it is known, the minimum set of multimedia system consists of a computer, projector, screen and speakers. Equipped with a video camera, microphone, headphones, supplemented by a smartboard, it successfully implements the task of creating a natural functionally comfortable foreign language environment (Tokarieva et al., 2021). At the same time, from the point of view of pedagogical ergonomics, it is important to ensure proper processing of information presented by multimedia, in particular – to organize active language practice of students, work on learning foreign languages, solving educational problems. Therefore, in the language laboratory we consider it appropriate to combine the screen on which the image of the learning task is projected, and the board on which such a task can be performed quickly (close test, restored scheme or sequence, support scheme, speech pattern, crossword puzzle, text, etc.) (Lynch, 1996). Such board should be white, have magnetic properties for attaching any illustrative material and be appropriate for work with coloured markers.

A full-fledged language laboratory should provide autonomous and network work of the group, prompt feedback between lecturers and students. This is facilitated by placing the group in a semicircle so that everyone has the opportunity to exchange information while working in a group, during frontal work with the blackboard in both real and online communication. A properly designed learning environment should use Internet communications, including Wi-Fi.

A review of the existing literature revealed the leading software tools for the organization of electronic, combined and blended learning of students in the language laboratory, namely:

- 1) tools of communication: SMS, smartphone, e-mail, chat, instant messaging, voice and video conferencing, forums;
- 2) means of presenting educational materials: electronic textbooks, text, hypertext, audio, video (including those located on websites, blogs, wikis,

video repositories, podcast servers, slide hosting, electronic libraries, file servers, cloud services);

- 3) means of practicing skills: simulators, virtual classes, electronic translators and dictionaries, multimedia materials, etc.;
- 4) collaboration tools (webinars, wikis, virtual classes, cloud services, web quests, collaborative projects, etc.);
- 5) means of assessment of educational achievements, monitoring and management of the learning process (survey, planning, testing) (Driscoll, 2002; Lavrentieva et al., 2021).

The proposed *pedagogical software* (PS) of foreign language teaching was based on a number of requirements, namely: 1) general didactic requirements (individualization, activity, student independence, scientific character, visualization of educational information, etc.); 2) linguistic requirements (correctness and normativeness of the language used); 3) methodical requirements (communicative and professional orientation of PS); 4) electronic-didactic requirements (interactivity, modular construction of the content of the material, multimedia presentation of study information, friendly interface) (Buzhykov and Buzhykova, 2020).

In our research, as a basis for the organization of active language practice, we use tools provided by well-known services, including Google, Office 365, Facebook, Edmodo, Studyboard and distance learning platforms such as LMS Moodle. The leading idea in their application was to create a semantic basis for the technology of the *teacher's website* – an interactive didactic tool that allows the organization of interaction between all participants in the educational process. Analysis of advanced pedagogical experience shows that the teacher's website is a holistic information and communication technology that can provide pedagogical guidance in teaching foreign languages to students (Holiver et al., 2020). In our practice we use such models of application of the teacher's website technology as: *subject site, educational site, thematic blog, portfolio site*.

Among other existing opportunities for organizing students' work, we chose the LMS Moodle platform, which allows convenient organization of the entire foreign language course, in particular: presents students with curriculum, schedules, provides teaching materials in electronic and multimedia format (Stanford, 2009). With the help of the LMS Moodle platform, even a teacher who is not well versed in computer technology can independently form their own strategy for foreign language teaching, which includes the necessary amount of educational material

in text, graphics and multimedia forms, audio and video database, a list of hyperlinks to achieve specific learning objectives. In general, for the implementation of feedback between lecturer and student, the system supports the exchange of files of any format, allows to organize joint studying activities, energetic foreign language communication through a blog, forum, workshop etc. This significantly intensifies the learning process, ergonomically organizes the students' study activities and allows the implementation of many pedagogical technologies for teaching foreign languages – training, design, interactive, game, test, etc., as well as hypermedia, media, multimedia technologies.

According to the results of the analysis of scientific and methodical literature, we came to the conclusion that the structure of the network electronic methodical complex is not regulated. The *electronic complex* developed within the limits of our professional activity includes both the volume obligatory for studying (electronic educational materials, audio and video applications, test materials, podcasts and videocasts, links to them), as well as additional one, constructed on the principle of complex differentiation (glossary of professional terms, materials for independent project activities, additional scientific, technical and linguistic resources, links to reference materials). In addition, the complex combines the advantages of a text editor, e-mail, e-journals and many other attributes of modern information and communication technologies, represented by the LMS platform like Moodle. The object orientation of the platform provided individual adjustment of certain elements of the training course to the needs of lecturers and students.

The educational complex we used for the study of foreign languages is structured in a module, in accordance with the curriculum of the discipline. The structural components of each module are: a text page, a list of links, a book, an explanation, a workbook, a forum, an exercise, a test, a webinar. Each of them consists of such sections as: Reading, Vocabulary, Listening and Video. Materials for study are presented by topics and content training modules. An important part of the complex is a system of test tasks that are processed automatically using the built-in Moodle services. The "Forum" option is used by us for the formation and development of oral and written speech skills, as well as for the organization of foreign language communication (Rymanova, 2013).

At the same time, we practice the means of a *thematic blog* – a specially created resource, which contains relevant information for students of scientific, technical, cultural, linguistic and professionally sig-

nificant nature, mostly in a foreign language (Polat, 2009).

In authors' opinion, the effective teaching of foreign languages and its intensification is facilitated by the use of relevant media materials in shaping the content of the teacher's website and its varieties. In particular, the texts of such British newspapers as: "The Guardian", "The Observer", "The Times", "The Sunday Times", "The Daily Telegraph", "The Sunday Telegraph", "The Independent", "The Independent on Sunday", "The Financial Times". We believe that the British press is a classic example of a comprehensive coverage of the processes taking place in the country and abroad in various spheres of political, socio-economic and cultural life (Tokarieva et al., 2021).

The appropriate content of the teacher's website is all kinds of professionally important information provided by means of tool technology. In particular, *TED (Technology Entertainment Design)* presentations are widely used in the work of lecturers of the Department of Foreign Philology, Ukrainian Studies and Social and Law Disciplines of the Mykhailo Tuhon-Baranovsky Donetsk National University of Economics and Trade and Department of the English Language with Methods of Teaching of the Kryvyi Rih State Pedagogical University. *TED* is a private non-profit foundation in the United States that has held annual conferences since 1984 to promote unique ideas. Some of the lectures on science, art, design, politics, culture, business, global issues, technology and the entertainment industry are available on the conference website (<https://www.ted.com/>). Lectures are usually held at a high methodological and linguistic level, their topics concern, in particular, issues of subject specialization of students, as well as their culturological, socio-cultural, linguistic needs. As of today, more than 400 video recordings of lectures in different languages are available online. The translations are available in subtitle format. Therefore, videocasts from this site can serve as a semantic basis for the organization of foreign language teaching in non-language institutions of higher education.

Now, there are a lot of websites offering similar services. We are intended to mention some of them. The *Learn Out Loud* provides the podcasts and other educational materials in the 16 directions (<https://www.learnoutloud.com>). The *Artana* spreads the lectures about Art for free (<https://artanablog.com>). The *Englishcentral* contains interesting audio and video materials to study various topics equipped with subtitles (<https://www.englishcentral.com>). *English Listening Lesson Library Online (ELLO)* permits acquainting students with issues of modern society (<https://www.ello.org/>). And this is not to men-

tion the numerous foreign language educational channels on *YouTube*.

In the practice of teaching foreign languages, we usually use two modes of operation. *Synchronous mode* of management of students' study activities involves the use of network technologies and real-time communication, in particular through video conferencing, web conferencing, virtual classrooms, chats etc. (Bykov and Shyshkina, 2018). Access to Internet resources, the possibility of authentic communication, acquaintance with the latest advances in science and technology, participation in international discussions significantly increases the level of motivation of students to learn a foreign language. At the same time, there is an intensification of educational activities, when students replenish their vocabulary, improve their receptive and productive skills, form and improve skills of dialogic speech, get acquainted with the culture and traditions of the language they are studying in a convenient time and space format (Neagoescu and Bostina-Bratu, 2016).

Asynchronous communication allows us to exchange time-delayed information via the Internet. The possibilities of podcast and videocast technologies, e-mail correspondence, forums, chats, specialized sites, blogs, and electronic libraries can be widely used here. Foreign forums, joint projects with foreign students, quests, postponed conferences, work on foreign language sites, and communities on social networks have significant opportunities in the formation of foreign language communicative competence.

#### 4.4 Effectiveness Evaluation of Designing the Educational Environment for Learning Foreign Languages

An important criterion for the effectiveness of pedagogical technologies in teaching foreign languages, along with the level of formation of foreign language communicative competence, is the *ergonomics of the learning environment*, which reflects the degree of influence on lecturer and students of psychophysiological, physiological, anthropometric and hygienic factors. This means assessing the effectiveness of foreign language teaching using pedagogical technologies (accuracy, reliability, productivity of their application) and compliance with human psychophysiology (safety for lecturer and student health, level of tension and fatigue, emotional impact on the process of lecturer and student) (Skydan, 1999, p. 11–12).

*Ergonomic criterion* serves three main factors of influence of pedagogical technologies on the educa-

tional environment – technological, labour and organizational ones (Skydan, 1999).

The *technological factor* involves the assessment of teaching aids, technical equipment, content and procedural parameters of applied pedagogical technologies. This involves, first of all, taking into account the anthropometric and biomechanical characteristics of the applied technical teaching aids, which should reduce the cost of muscular and mental energy, replace manual processes with automated, reduce static and dynamic load of information channels of students and lecturers. At the same time, in pedagogical ergonomics it is important to assess the degree of manufacturability of the educational process: algorithmicity, conceptuality, expediency, subjectivity, purposefulness, reproducibility, effectiveness, controllability, design, statefulness, etc. A certain level of manufacturability should provide a certain quality of educational material (depth, effectiveness, strength, system) compared to “non-technological” approaches.

Pedagogical ergonomics also takes care of the degree of workload of students and lecturers. Insufficient workload of students due to prolonged automatic execution of monotonous actions and operations or insufficient level of problems or overload due to rapid rate of presentation of information or exceeding its volume dramatically reduce the effectiveness of foreign language studying. The state of functional comfort is also provided by external factors: the aesthetics of the room, the norms of the work environment, the workplace, the teaching aids offered by the lecturer (Karapuzova et al., 2012).

*The labour factor* considers the rhythm and intensity of study work, the correctness of individual actions with maximum economy of movement and prevention of awkward position during the work, its compliance with speed, energy, visual and other capabilities of students and lecturers. To the kinetic characteristics of the labour factor adds aesthetic – the conformity of the design of jobs, objects of labour, components of pedagogical technologies to the aesthetic needs of students and lecturers in the process of foreign languages learning (Okulova, 2011).

*The organizational factor*, first of all, takes into account the organization of the workplace of students and lecturers in the educational environment (in the classroom and virtual language laboratory). This involves a certain functional organization for a student or group of students to perform certain educational work with the use of pedagogical technologies. Properly organized workplace includes the availability of sufficient workspace; basic and auxiliary language equipment, convenient approach and access to them;

the ability to establish physical, visual and auditory connections between the subjects of the educational process; safety priority; compliance with the norms of the working environment (permissible noise level, temperature, light, humidity, etc.), the possibility of remote autonomous studying.

Thus, the *indicators on ergonomics criterion of the educational environment* include: functional comfort of the student; technological, labour and organizational parameters of the educational environment of learning foreign languages with the use of pedagogical technologies and modern technical teaching aids, the quality of learning foreign language knowledge by students, the degree of their sensitivity to new technologies of educational activities.

Ergonomic analysis of the level of functional comfort of students in teaching foreign languages with the use of pedagogical technologies was conducted using the method of expert evaluations (figure 4).

Based on the testing of the card above in the pre-quarantine period, it was found that the reason for most of the failures of students is their failure to master at the appropriate level of pedagogical technologies for studying foreign languages, especially instrumental technologies. Unformed ability of individual students, especially freshmen, to concentrate, quickly switch attention, engage in work in the classroom, organize their work space, which affects the working environment in the language laboratory. Quantitative indicators are shown in table 1.

Table 1: Degree development dynamics of students' study work ergonomics (in %).

Indicators	Study year		
	I	II	III
Elementary	40,0	31,3	25,0
Intermediate	40,0	31,3	31,3
Upper-Intermediate	12,0	20,8	22,9
Advanced	8,0	16,6	20,8

Thus, we singled out the *contradiction* between the existing potential of foreign language teaching pedagogical technologies in the direction of intensification of learning, complex impact on the motivational, cognitive and linguistic spheres of students' personality and the existing average level of effectiveness of their use in the educational process at a non-language higher education institution. A number of *difficulties* have been identified, including: objective difficulties due to economic factors – extremely small amount of time for learning a foreign language in a non-language free economic zone, lack of funding for extracurricular activities and elective courses; insufficient hardware and software of instrumental tech-

nologies, limited direct communication with native speakers. There are also difficulties of semantic nature – imperfect development of the educational environment in terms of its ergonomics and functional comfort of students in the language laboratory, as well as procedural nature – insufficient level of mastery of some foreign language lecturers of instrumental educational technologies, especially computer and network; the advantage of technology-transformations in the educational activities of students, uniformity in their use; low share of communicative activity of students, their participation in extracurricular activities for professional interests during their studies in higher education institutions.

At the same time, the experience of application and widespread use of instrumental technologies during quarantine measures, balanced approach and hard work of foreign language teachers in the development of professional skills allowed to achieve significant changes in the levels of ergonomics of the educational environment (table 2).

Table 2: Ergonomic factor dynamic of students' study work (in %).

Levels	December	September
	2019	2021
Elementary	40,0	20,0
Intermediate	40,0	30,0
Upper-Intermediate	12,0	30,0
Advanced	8,0	20,0
Pearson's $\chi^2$ -criterion	20,952 > 11,345, $p = 0,001$	

This became possible due to the design of the learning environment taking into account the requirements of pedagogical ergonomics, which intensifies the teaching of foreign languages by means of instrumental pedagogical technologies.

## 5 CONCLUSIONS

Having considered the features learning environment design that provides intensive teaching of foreign languages to students of non-linguistic specialties, we came to the following conclusions.

1. The pedagogical technologies of teaching should be considered as types of concepts from generic "pedagogical technologies". In the teaching methods of foreign languages such technologies are based on the communicative-activity approach; their leading idea is modelling a real foreign language professionally oriented communication in the educational process, principles are speech orientation, individualization and the pri-

Parameter	Feature	Evaluation zones	Grade
<b>Technological factor:</b> technical perfection; compliance with anthropometric data; functionality, quality, sufficiency	Language / linguistic laboratory, its equipment	0-10	
	Virtual language laboratory, its completeness	0-10	
	Educational content	0-10	
	Didactic teaching aids	0-10	
	Computer-based technical teaching aids, local area network, Internet	0-10	
	Pedagogical software for teaching foreign languages	0-10	
<b>Labour factor:</b> aesthetics, compliance with psychophysiological and psychological characteristics of a human; requirements of labour protection and hygiene	Classroom design	0-10	
	Virtual lab interface	0-10	
	Rhythm, regularity of the educational process	0-10	
	Ease of use of technical teaching aids, equipment	0-10	
	Labour intensity	0-10	
	Educational and methodical complex of teaching the discipline	0-10	
<b>Organizational factor:</b> time indicators; functionality of educational work, authenticity of content	Student workplace in the classroom	0-10	
	Student workplace in a virtual laboratory	0-10	
	Organization of independent study work	0-10	
	Organization of extracurricular activities (clubs, electives, events)	0-10 and additional 2 points	
	Organization of communication with native speakers	0-10	
	Research work in the specialty by means of a foreign language	0-10 and additional 2 points	

Figure 4: Expert card for assessing technological, labour and organizational parameters of educational environment.

mary role of the personal aspect, situationality and novelty, professionalization. The pedagogical technologies of teaching foreign languages can be classified based on different methodological principles, namely: according to the place in the organization of educational process, under the methodological approaches to their development and application, according to the subjects of the educational process, under the level of application. A special place among them belongs to instrumental technologies.

2. The instrumental technologies of foreign language teaching are considered as a process of development and application of special teach-

ing aids, which is based on the methodology of foreign language teaching and is aimed at achieving educational goals. The instrumental technologies include such interdependent components as 1) technologies of technical teaching aids application; 2) computer learning technologies; 3) telecommunication technologies based on the use of telecommunication means and networks as well as 4) hybrid models of instrumental technology, where the technologies of electronic learning are in their heart.

3. Pedagogical ergonomics is the direction of modern pedagogy, which aims to comprehensive study and design the pedagogical activities of lecturer

and students in the system “educator – student – learning environment” to ensure its effectiveness and optimality. These features permit the use of ergonomic approach to design education environment for intensive learning foreign language by means of digital technologies. The effectiveness of the application of pedagogical technologies of foreign language teaching depends on the appropriate design of the learning environment, where the activities of teaching and studying take place in external and internal plan. Designing the learning environment from the standpoint of pedagogical ergonomics requires the construction of a special language environment for students – material and virtual. This requires taking into account the production, sanitary, anthropometric, psychophysiological and aesthetic factors of study work, which is organized using pedagogical technologies of foreign language teaching including instrumental technologies.

4. The widespread use of multimedia teaching aids and instrumental technologies based on computer makes it possible to properly design the workspace of foreign language teaching in the physical or virtual language laboratory in order to achieve the required level of functional comfort for teachers and students. In this purpose it should consider organization of physical space, availability of the necessary set of computer equipment and technical teaching aids, pedagogical software, rhythm of study work, mode of study activities (synchronous, asynchronous), available opportunities in the use of educational Internet resources. In any case, design of the process of foreign language learning by means of instrumental technologies should be realised through the prism of functional structure of the system “lecturer – student – learning environment”, and to do the ergonomic analysis of the learning environment in two directions – from human requirements to technical teaching means of learning and the conditions of their optimal use, and vice versa – from the requirements of instrumental technologies and conditions of their operation to a human.
5. Ergonomic model of learning environment organisation reflects the degree of influence on lecturer and students of psychophysiological, physiological, anthropometric and hygienic characteristics of study work. Degree of influence of instrumental technologies on the educational environment of foreign languages learning can be defined with help of ergonomic criterion, which estimates three main factors – technological, labour and organizational ones. The indicators on ergonomics

criterion of the educational environment include: functional comfort of the student; technological, labour and organizational parameters of the educational environment of learning foreign languages with the use of pedagogical technologies and modern technical teaching aids, the quality of learning foreign language knowledge by students, the degree of their sensitivity to new technologies of educational activities. Ergonomic analysis of the level of functional comfort of students in teaching foreign languages with the use of instrumental technologies can be conducted using the method of expert evaluations and special expert card.

The positive dynamics in the levels of ergonomics obtained as a result of approbation of the method of learning environment design for teaching foreign languages by means of instrumental pedagogical technologies allows us to consider it as appropriate and effective one.

Given the fact that in a modern digital society, new technological approaches are constantly being developed, the prospect of further research seems in the development of a methodology for the use of smart-technologies, augmented reality technologies, technologies for mobile learning for foreign language teaching.

## REFERENCES

- Amelina, S. M., Tarasenko, R. O., Semerikov, S. O., and Shen, L. (2022). Using mobile applications with augmented reality elements in the self-study process of prospective translators. *Educational Technology Quarterly*, 2022(4):263–275. <https://doi.org/10.55056/etq.51>.
- Bartosh, D., Stoyanova, E., Galskova, N., and Petkova-Kaleva, S. (2020). Teaching foreign languages in the context of cognitive and conceptual priorities of modern education. *Ezikov Svyat*, 18(1):186–196.
- Bespalko, V. P. (1960). Requirements of educational films for professional and technical education. *Soviet Education*, 2(3):17–19. <https://doi.org/10.2753/RES1060-9393020317>.
- Bondar, N. V., Konovalenko, T. V., and Riznitskii, I. G. (2022). Development of Future Foreign Language Teachers’ Soft Skills by Means of ICT in Ukrainian Universities. In Semerikov, S., Osadchyi, V., and Kuzminska, O., editors, *Proceedings of the 1st Symposium on Advances in Educational Technology - Volume 2: AET*, pages 425–433. INSTICC, SciTePress. <https://doi.org/10.5220/0010932400003364>.
- Burov, O. and Pinchuk, O. (2021). Extended reality in digital learning: Influence, opportunities and risks’ mitigation. *CEUR Workshop Proceedings*.

- Buzhykov, R. and Buzhykova, R. (2020). The potential of STEAM-technologies in teaching foreign languages. In *Proceeding of the International scientific-practical seminar on December 8, 2020 "Innovations and traditions in students' language training"*, pages 42–45.
- Buzhykov, R. P. (2006). *Pedagogical conditions of application of innovative and communication technologies in the process of teaching foreign languages to students of higher economic educational institutions*. Candidate's thesis: 13.00.04, Kyiv.
- Bykov, V. Y. and Shyshkina, M. P. (2018). The conceptual basis of the university cloud-based learning and research environment formation and development in view of the open science priorities. *Information Technologies and Learning Tools*, 68(6):1–19.
- Chorna, O. V., Hamaniuk, V. A., Markheva, O. Y., Voznyak, A. V., and Uchitel, A. D. (2022). Use of YouTube Resources in the Process of Training German Language Teachers. In Semerikov, S., Osadchyi, V., and Kuzminska, O., editors, *Proceedings of the 1st Symposium on Advances in Educational Technology - Volume 1: AET*, pages 511–526. INSTICC, SciTePress. <https://doi.org/10.5220/0010925800003364>.
- Daniushenkov, V. S. (1994). Students' practical projects from the standpoint of pedagogical technology. *Russian Education & Society*, 36(9):66–76. <https://doi.org/10.2753/RES1060-9393360966>.
- Driscoll, M. (2002). Blended learning: Let's get beyond the hype. *E-Learning*, 3(3).
- Esnault, L. (2007). *Web-based education and pedagogical technologies: Solutions for learning applications*. IGI Global. <https://doi.org/10.4018/978-1-59904-525-2>.
- Gervas, O. G. (2011). *Ergonomics*. Vizavi, Uman.
- Guerrero, S. M. (2005). Teacher knowledge and a new domain of EXPERTISE: Pedagogical technology knowledge. *Journal of Educational Computing Research*, 33(3):249–267. <https://doi.org/10.2190/BLQ7-AT6T-2X81-D3J9>.
- Gurevich, R., Gurjii, A., and Kademiya, M. (2016). *Information and communication technologies in vocational education*. Nilan, Vinnytsia.
- Hodovaniuk, T. L., Makhometa, T. M., Tiahai, I. M., Medvedieva, M. O., Pryshchepa, S. M., and Voznyak, A. V. (2022). Educational Trainings as One of the Effective Forms of Digital Competence Development of Secondary School Teachers. In Semerikov, S., Osadchyi, V., and Kuzminska, O., editors, *Proceedings of the 1st Symposium on Advances in Educational Technology - Volume 2: AET*, pages 372–381. INSTICC, SciTePress. <https://doi.org/10.5220/0010931900003364>.
- Holiver, N., Kurbatova, T., and Bondar, I. (2020). Blended learning for sustainable education: Moodle-based English for Specific Purposes teaching at Kryvyi Rih National University. *E3S Web of Conferences*, 166:10006.
- Karapuzova, N. D., Pochynok, Y. A., and Pomohaibo, V. M. (2012). *Fundamentals of pedagogical ergonomics*. Akademvydav, Kyiv.
- Klarin, M. V. (2016). Twenty-first century educational theory and the challenges of modern education: Appealing to the heritage of the general teaching theory of the secondary educational curriculum and the learning process. *Russian Education and Society*, 58(4):299–312. <https://doi.org/10.1080/10609393.2016.1250510>.
- Kramarenko, T. H., Pylypenko, O. S., and Serdiuk, O. Y. (2022). Digital Technologies in Specialized Mathematics Education: Application of GeoGebra in Stereometry Teaching. In Semerikov, S., Osadchyi, V., and Kuzminska, O., editors, *Proceedings of the 1st Symposium on Advances in Educational Technology - Volume 1: AET*, pages 576–589. INSTICC, SciTePress. <https://doi.org/10.5220/0010926300003364>.
- Kravtsova, I. A., Kravtsova, A. O., Hamaniuk, V. A., Bilozir, O. S., and Voznyak, A. V. (2022). Development of Professional Competence of Primary School Teachers of the New Ukrainian School in the Aspect of Foreign Language Teaching. In Semerikov, S., Osadchyi, V., and Kuzminska, O., editors, *Proceedings of the 1st Symposium on Advances in Educational Technology - Volume 1: AET*, pages 164–187. INSTICC, SciTePress. <https://doi.org/10.5220/0010922200003364>.
- Kukhareno, V. (2017). Features of the electronic university. *Open educational e-environment of modern university*, 3:238–246.
- Kuts, M. O. (2021). Technique approaches in teaching foreign languages to student of economics. *Bulletin of Alfred Nobel University. Series "Pedagogy and Psychology"*, 1(21):172–177.
- Lavrentieva, O., Horbatiuk, R., Skripnik, L., Kuchma, O., Penia, V., and Pahuta, M. (2021). Theoretical and methodological bases of designing the educational institution information and consulting environment. *Journal of Physics: Conference Series*, 1840:012060. <https://doi.org/10.1088/1742-6596/1840/1/012060>.
- Lavrentieva, O. O. (2019). Ergonomic approach to the organization of educational heals-saving environment. In Rybalko, L. M., editor, *Health technologies in the educational environment*, pages 94–111. Osadtsa V. M., Ternopil.
- Lozynska, L., Ishchuk, N., Ferri, A., and Tsihotska, O. (2021). Experience of using information and communication technologies in foreign language teaching. *Youth and the market*, (4 (190)):125–131.
- Lyakhovitsky, M. V. and Koshman, I. M. (1981). *Technical means in teaching foreign languages*. Prosveshchenie, Moscow.
- Lynch, T. (1996). *Communication in the Language classroom*. Oxford Handbooks for Language Teachers Series. Oxford University Press, Oxford.
- Molnar, A. R. (1997). Computers in education: A brief history. *THE Journal*, 24(11):63–68.
- Negoescu, A. and Bostina-Bratu, S. (2016). Teaching and learning foreign languages with ICT. *Scientific Bulletin*, 21(1(41)):21–27.
- Nikolaeva, S. and Synekop, O. (2020). Social aspect of student's language learning style in differentiated esp in

- struction. *Universal Journal of Educational Research*, 8(9):4224–4233.
- Okulova, L. P. (2011). *Pedagogical ergonomics*. IKI, Izhevsk.
- Petersson, K., Olsson, U., and Popkewitz, T. S. (2007). Nostalgia, the future, and the past as pedagogical technologies. *Discourse*, 28(1):49–67. <https://doi.org/10.1080/01596300601073598>.
- Polat, E. S. (2004). Pedagogical technologies for distance learning. *Upravlyayushchie Sistemy i Mashiny*, (4):62–69.
- Polat, E. S., editor (2009). *New pedagogical and information technologies in education*. Logos, Moscow.
- Prykhodko, A. M., Rezvan, O. O., Volkova, N. P., and Tolmachev, S. T. (2019). Use of Web 2.0 technology tool – educational blog – in the system of foreign language teaching. *CTE Workshop Proceedings*, 6:256–265. <https://acnci.org/10.55056/cte.389>.
- Rozhkova, F. M. (1987). *Movies in English lessons*. Prosvescshenie, Moscow.
- Rozhkova, N. (2014). The use of information and computer technologies as an innovative method in teaching foreign languages. *Scientific notes Pedagogical Sciences*, page 121–125.
- Rymanova, I. E. (2013). Using the moodle environment for teaching a professional foreign language to students of a technical university. *Philological sciences. Questions of theory and practice*, (11(29). Part II):164–167.
- Serdyukov, P. I. (1997). *Theoretical bases of teaching foreign languages in a language university with the use of information technologies*. D.Sc. thesis: 13.00.02, Kyiv.
- Skinner, B. F. (1931). The concept of the reflex in the description of behavior. *The Journal of General Psychology*, 5(4):427–458.
- Skydan, S. O. (1999). *Ergonomic foundations of the educational process in high school*. D.Sc. thesis: 13.00.01, Kyiv.
- Stanford, J. (2009). *Moodle 1.9 for Second Language Teaching: Engaging online language-learning activities using the Moodle platform*. Packt Publishing.
- Strelnikov, V. Y. (2002). *Pedagogical bases of providing personal and professional development of students by means of innovative technologies of training*. RVV PUSKU, Poltava.
- Tarnopolsky, O., Volkova, N., and Kozhushko, S. (2020). Sustained english lingua-cultural education: A solution for Ukraine. *E3S Web of Conferences*, 166:10004.
- Thorndike, E. L. (1932). *The Fundamentals of Learning*. Bureau of Publications. Teachers College, Columbia University, New York.
- Tkachuk, V. V., Yechkalo, Y. V., and Semerikov, S. O. (2019). The research of process of applying mobile ict by university students: mobile testing systems and mobile means of multimedia development. *Educational Dimension*, 1:125–146. <https://doi.org/10.31812/educdim.v53i1.3839>.
- Tokarieva, A. V., Volkova, N. P., Degtyarivova, Y. V., and Bobyr, O. I. (2021). E-learning in the present-day context: from the experience of foreign languages department, PSACEA. *Journal of Physics: Conference Series*, 1840.
- Young, J. A. (1961). Programmed instruction in chemistry - an invitation to participate. *Journal of Chemical Education*, 38(9):463–465. <https://doi.org/10.1021/ed038p463>.
- Zimnyaya, I. (2021). *A psychological analysis of translation as a type of speech activity*, volume 3. Taylor and Francis Inc.