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# An adaptive system of teaching a foreign language to students of pedagogical specialties: European experience



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**Abstract** The individual characteristics of foreign language acquisition among students of pedagogical specialties and the selection of adaptive technologies considering these characteristics are examined in the article. An analysis of studies by methodological researchers that explores the psycho-physiological features of students' memory, thinking, attention, and the emotional sphere is provided. The article presents data on training students in pedagogical specialties based on the authors' developed learning model, utilizing adaptive educational technologies that consider individual language learning styles. Adaptive technologies such as communicative and audio-visual methods (AVM), personalized learning technologies, control-corrective teaching technologies (CCTT), business games, and adaptation-expansion-variation (AEV) learning technologies by both domestic and foreign authors are discussed. It is proven that students possess significant potential in intelligence and personality for effectively acquiring a foreign language in intensive learning conditions. For teachers, it is vital to select the appropriate adaptive technologies based on each student's group and individual characteristics. At the same time, educational institutions need to implement specific measures to support existing motivation and identify personal student traits that actively influence the learning process. Existing research conducted both in our country and abroad (mainly focusing on adaptive information systems) does not provide unanimous consensus on the effectiveness of the adaptive approach. Whether this is due to shortcomings in the conducted studies or the limitations of adaptive technologies remains to be seen as the adaptive approach is still in development. However, this method has shown effectiveness for students with certain levels of knowledge, skills, language abilities, and motivation when learning any foreign language. Other researchers in teaching foreign languages in pedagogical institutions can consider these results and develop their own variations of educational content within the framework of standard discipline programs. The more such studies are conducted, the faster this field of educational technology will be developed and the more promising its application will become clear. Additionally, the study can be extended toward developing electronic platforms based on existing content.

**Keywords:** adaptive teaching, European experience, foreign language, primary school teacher<sup>a</sup>, secondary school teacher, trauma-informed pedagogy

## 1. Introduction

The necessity of using information and communication technologies in professional activities, which enhance the possibilities of foreign language communication, increases the number of students learning a foreign language. Teaching students of pedagogical specialties based on the model of teaching developed by the article's authors is conducted throughout the entire study period by applying adaptive educational technologies and considering the individual style of foreign language acquisition. Implementing the general educational program involves creating variable and invariant learning conditions for student-teachers. The variant conditions include the identification and accounting of individual learning styles of student-teachers. These styles are identified through psychological and pedagogical testing and adaptive educational technologies (a complex of adaptive technologies and methods). The invariant learning conditions include the identity of the requirements for conducting previous sections, which determine the student's level of knowledge, the number and content of tasks, assessment criteria, and materials used for learning: textbooks and additional materials such as texts, series of exercises, and audio texts.

Considering the educational needs of student-teachers, the priority is achieving mandatory effectiveness, ensuring the attainment of this result, which improves their quality of life to some extent. As research suggests, they learn what they need, while an adult, under compulsory conditions, may agree to less effective learning, perceiving it as formal. The results can vary, including strict, standardized knowledge, acquisition of necessary skills, skill mastery at an automated level, essential



understanding of professional or universal phenomena, new perspectives, and broadening horizons. All of this and more should be guaranteed to any adult learner to the extent they require it, and they should be able to acquire it as personal assets "here and now."

When approaching the teaching process of student-teachers, it is necessary to be prepared because their learning is more complex than children's one. Student-teachers have certain advantages over children, making their second language acquisition more successful. These advantages include high cognitive potential and education (especially in individuals with higher education), erudition, developed intelligence, and increased motivation and self-regulation.

This study proposes developments in the field of individualizing foreign language learning in pedagogical universities, which could serve as a basis for synthesizing individual learning trajectories and online platforms in the future.

## 2. Literature Review

At the stage of information technology development, creating adaptive systems in the pedagogical sphere is not difficult. However, implementing an adaptive approach requires revising existing standards and curricula, including foreign language ones (Briggs and Anderson 2019), (FitzGerald et al 2018), (Dagger et al 2002), (Chrysafiadi et al 2018), (Chiu et al 2017).

For this reason, adaptive systems have been tested and implemented as a supplement to traditional forms of education, mainly in Western universities. Implementing the adaptive approach was expected to increase students' motivation to learn, desire to continue their studies, and learning efficiency (Wang and Liao 2011), (Udovychenko et al 2021), (Strayer 2011).

However, today, there is little evidence of the adaptive approach's effectiveness. Among the main ones are the works of Newman and co-authors (Newman et al 2013), (Higgins et al 2008), (Semenets-Orlova et al 2022), (Semenets-Orlova et al 2022), (Oxman and Wong 2014), (Nabizadeh and Goncalves 2020), (Kirschner 2017), (Iatsyshyn et al 2020).

Many researchers refer to personalized learning paths, i.e., the basis of adaptive learning, as person-centered, student-centered, cooperative learning, on the one hand, or software development, on the other. However, neither scientific strategy fully defines what an adaptive approach in modern pedagogy means (Alekseieva et al 2022), (Johanes and Lagerstrom 2017). Therefore, the adaptive approach modifies the existing educational base, adjusting it to the needs of a particular student or students group according to educational content, planned schedule, and teaching and assessment materials, as set out in the state standard and curriculum (Martin and Markant 2020), (Ladonko et al 2023), (Kryshtanovych et al 2022), (Kosharna and Petryk 2022), (Kosharna et al 2022), (Kosharna et al 2022).

One of the challenges is the complexity of constructing an accurate student model due to the subjectivity of various characteristics that are attempted to be identified through learning style testing, perceptual learning styles, and information processing types. The identification of such styles or types (David Kolb's model, Peter Honey, and Alan Mumford's model, learning modalities, Neil Fleming's VAK/VARK model, Felder-Silverman model, Anthony Gregorc's model, cognitive approaches, NASSP model, learning styles by Honey and Mumford) has been criticized, leading the scientific community to conclude the inadequacy of learning style theories. Yu. Wang and H.K. Liao proposed other criteria for teaching English, including gender, levels of learning motivation, and two cognitive learning styles, intellectual and sensory, which determine the optimal learning sequences (Chen et al 2005), (Jones et al 2013), (Brown et al 2020), (Bernard et al 2015), (Bakhov et al 2021), (Akimova et al 2022).

Hence, this problem remains even more relevant due to the wartime incidents.

## 3. Materials and Methods

The study employed various general scientific methods, including comparative, comparative-contrastive, analytical, historical, and others. The research was conducted using a combination of comprehensive methods that ensured the effectiveness and scientific validity of the research results. The theoretical approach involved analyzing, systematizing, and comparing scientific and pedagogical literature provisions to elucidate the state of the investigated problem and understand the essence of reflecting and implementing educational technologies in the teaching and learning process. Generalization and systematization methods were employed to substantiate the theoretical foundations of the research. The pedagogical observation was used to assess future language teachers' readiness levels after implementing a series of activities.

## 3. Results and Discussion

A personalized educational trajectory implemented in information systems entails adapting learning materials' content and/or tasks and/or sequencing. None of the developed educational systems adapt all three components. However, since this research is empirical and focuses not so much on creating a computer system as on its theoretical basis, the potential adaptation of all three components—content, tasks, and sequencing—is considered here.

Computer systems refer to the ability to tailor the curriculum to each student. However, the curriculum is stable in domestic higher education institutions, and adapting any component can only be done within its framework.

Another important point is that adaptive courses may imply self-paced online learning. In the case of self-study, creating an individual learning trajectory is much simpler. For example, the mastery of a new topic can occur only after the previous one has been mastered. In a higher education institution's rigid curriculum, such a flexible system cannot be implemented during class hours. Less successful students are offered more independent work through an adaptive system in such cases.

Within this understanding of the adaptive approach, pedagogical, subject domain, and student models are necessarily created. The pedagogical model encompasses methods, questions, prompts, and assessment of acquired knowledge - all of which adapt the learning to the individual student. The subject domain model refers to a hierarchical and structured knowledge base with rules for progressing through each level. The student model involves developing and adjusting individual learning trajectories based on test results, including cognitive-psychological assessments.

In applying the adaptive approach described in this article, fully individualized learning is problematic. Therefore, the experimental group is divided into three subgroups: weak, average, and strong. Accordingly, an adaptive method model was created, and its experimental verification was conducted.

Due to this circumstance, the adaptation model discussed in this article will not include testing for information perception types/learning styles. However, students are offered diverse learning materials that cover all potential information perception characteristics of pedagogical students. For example, written texts and oral explanations can be combined with images, objects, videos, and blackboard work. The standard material explanations can be combined with innovative, associative formulations presented differently, starting with a general overview and gradually examining details. Written assignments can be combined with oral activities such as dictations, discussions, and role-playing.

Some of the challenges associated with adaptive systems in general and the specific model under consideration include:

- The project cost is due to the expenditure of a significant amount of time, finances, and human resources. The basis for creating an adaptive system includes many multi-level educational materials and several pathways for its progression. It requires extensive preparatory work separate from teaching. The absence of an adaptive model for foreign language learning in a pedagogical institution (where courses have already been designed for chemistry, anatomy, physiology, history, economics, mathematics, management, biology, programming, and social sciences) is linked explicitly to the energy-intensive nature of developing such a model.

- Limited classroom hours pose specific difficulties if the student population within a group is heterogeneous in terms of their knowledge, skills, abilities, and psychocognitive characteristics.

The model of an adaptive approach to foreign language learning in a pedagogical university involves creating an algorithm or schedule according to which individualized learning occurs. The scholars propose different criteria for selecting a particular learning pathway according to the algorithm. Such criteria include foundational knowledge, visual, auditory, and kinesthetic learning styles, task types, complexity, and learning goals.

The proposed algorithm of the adaptation model consists of the following stages:

1. Identification of the adaptation object - theory, texts, exercises, tasks. Since foreign language teaching in pedagogical universities is usually based on a fixed program, the adaptation objects remain more or less unchanged, with modifications made only to their complexity and sequence of presentation. Thus, texts, exercises, and tasks are presented in three versions - simplified, standard, and advanced - but based on the same material. The variations differ in the presence/absence of specific grammatical and lexical difficulties and nuances. Additionally, the simplified version allows immediate attention to verbal and grammatical problems and their prompt resolution.

2. The entrance test determines the student's level of preparedness and identifies the areas of unknown knowledge that will be studied. It also identifies the student's psycholinguistic characteristics, which form the basis for designing the trajectory of learning new material. The entrance test includes the following:

- Lexical and grammatical tests to assess the student's knowledge, skills, and personal challenges.
- Test to assess the student's language learning abilities, such as the ability to comprehend knowledge, acquire skills, and apply them in practice, as well as the ability for analysis and synthesis.
- Test to evaluate the student's level of motivation.
- Time recording during the tests indicates a particular psychological personality type that affects the speed of information perception during classes.

3. All four tests are combined into a single test offered to the students. The maximum score for the entrance test is 100 points. Students who score 81-100 points are assigned to the advanced subgroup of the experimental group, those who score 65-80 points are given to the intermediate subgroup, and those who score below 65 points are assigned to the weak subgroup. It is important to note that the tests should be designed so that only one answer is correct for each question.

4. Division of students into experimental and control groups. This division is arbitrary and does not consider any group parameters. Based on the results of the entrance testing, the experimental groups are further divided into three subgroups, which may have different sizes but are relatively homogeneous in terms of the characteristics mentioned above.

5. Proposing to all three subgroups the study of similar materials with different levels of complexity (short and simplified presentation of the material, more detailed and complex expression, careful consideration of various lexical and grammatical nuances). The material studied between two tests can be referred to as a module.

6. Intermediate testing evaluates the level of preparation based on the completed module. The test offers visual, audio, and video materials covering different psychological information perception types.
7. If a student scores less than 50 points on the test, additional tasks are given for revising the previous module, followed by retesting.
8. If the test is successfully passed, the student is assigned a more challenging task to determine their current level. With high scores, the student moves to a stronger subgroup of the experimental group. Scoring between 50-65 points keeps the student in the weak subgroup or transfers them from the stronger subgroup. In this case, additional tasks for module revision are provided.
9. Study the next module according to the aforementioned conditions.
10. Intermediate testing continues following the abovementioned conditions until the final assessment.

The experimental subgroups were offered different versions of the approved training material. The standard training materials were modified to focus on the three selected subgroups. As this article cannot provide the entire course in an adaptive form, small text fragments and exercises are presented here as examples, one per task.

Lexical and grammatical tests are adapted to the particular learning material.

Regarding the assessment of time spent on taking the tests, if a student has a slow information perception rate and simultaneously achieves results other than "excellent" on the tests, they are placed in the weak subgroup. If students have a slow information perception rate but achieve good test results, they are placed in the average subgroup. If a student has a standard or accelerated information perception rate and reaches good or excellent test results, they are placed in the advanced subgroup.

Modern pedagogy constantly strives for innovation, including in foreign language training in technological universities, as it is understood that traditional methodologies do not always yield the necessary results for future professional activities. The latter can be attributed to the fact that each student entering a university brings their knowledge baggage and abilities to comprehend the material. Thus, an adaptive approach was created, where each learner follows their path, aligned with standards, curriculum, learning tasks, and the student's abilities to perceive and process information.

Two approaches emerge to address this task: simple individualized learning, on the one hand, and processing information about the student's needs, capabilities, and personal characteristics, and accordingly, machine-adjustment of the program for each student, on the other hand. The latter approach is more promising. Thus numerous computer platforms were created to implement the concept of electronic adaptive learning (Knewton, Smart Sparrow, MyLab, ALEKS, Cerego, CogBooks, Open Learning Initiative, Realizeit, Plario, Acrobatiq, McGraw Hill Education, Adapt Course /Connect, Intellipath, Fishtree, I-ready, DataCamp, Oefenweb, Pearson My Lab & Mastering, Dreambox). Such intelligent systems can analyze students' progress and synthesize a new variant of the training program tailored to their level of knowledge and their needs at the current stage of learning.

However, these platforms have not been popular in our country's universities. Additionally, they are primarily applicable to exact disciplines, and over time, it has been found that computer-adaptive course developments are not always necessary for students. For instance, adaptive information technologies are not needed for students with a high level of basic training, self-study effectiveness, and efficient self-monitoring. On the other hand, students within the same group may differ in terms of their level, requirements, and abilities. The standard program can only be applied to a part of the group. An adaptive approach without using information platforms can be applied to the rest of the students.

Based on the foregoing, the groups are formed following psychological and pedagogical testing results. It aims to determine the student's learning style and identify the dominant channel of new information perception. Typically, four groups of students are identified, differing in stylistic features of cognitive activity: "students-thinkers," "students-theoreticians," "student-pragmatists," and "student-activists." Each group of students has its own specific psycho-physiological learning characteristics.

Secondly, students are divided into groups based on the results of linguistic testing. It allows for determining the level of lexical-grammatical proficiency, the degree of logical expression, the pace and scope of speech, and the use of language clichés and patterns in the monologue speech of applicants. Practical observations show that students aged 27-33 demonstrate an average (Intermediate) and low (Pre-intermediate) level of foreign language proficiency. The students within the age range of 20-23, on the other hand, qualify for an intermediate ("Intermediate") and high ("Upper-intermediate") level of foreign language proficiency (23.4% - mostly students from other humanities faculties of BSU).

Further, it is necessary to focus on the technologies used in the authors' practice for teaching students. Recognizing the vast diversity of different technologies in modern foreign language learning processes, it is worth noting that the communicative teaching method holds a leading position in adaptive learning according to individual learning styles. It encompasses a wide range of techniques, tools, and forms of teaching. When considering the subjective relations between the teacher and students, the communicative method implements an orderly, systematic instruction of foreign languages. It largely determines the strength of knowledge retention.

Another communicatively oriented technology involves teaching based on synthesizing auditory and visual perceptions. The primary goal of the "audio-visual method" (AVM) is to develop a sensory foundation for language proficiency in learners.

This goal includes pictures, illustrations, graphics, diagrams, tables, tape recorders, slide and film strips, movies and videos, role-playing games, and more.

The effective utilization of visual mechanisms, such as repetition and contrast, ensures the repetition and contrasting of language phenomena and perceptions. The audio-visual method extends beyond structural frameworks and significantly emphasizes their application in various situations, achieving a communicative focus in teaching.

The next adaptive and highly suitable learning technology for heterogeneous groups can be considered the technology of individualized learning. This teaching technology involves an original lesson structure, where the first half of the lesson is dedicated to group learning, while the second half consists of two parallel processes: independent and individual work with the teacher. Thus, within the framework of the classroom-based system, approximately 60-80% of the teacher's time can be allocated for individual work with students who require more time to solve assigned tasks, while other students can engage in creative or practical assignments. The essence of these approaches lies in organizing students' work in different types of pairs: static, dynamic, and variational.

Business games (ethical and business-oriented), which represent a form of recreating the subject and social content of professional (societal, managerial, etc.) activities and modeling systems and experiences relevant to specific fields of human practice, can also be rightfully classified as adaptive learning technologies. Business games differ from other forms of learning in several ways:

- They involve the simulation of real-life socio-economic systems.
- The participants assume specific roles solely to gain experience in conflict resolution and make business decisions.
- Business games are always conducted as a collective learning method.
- They create an emotional atmosphere to enhance the learning process.

## 5. Conclusions

Therefore, based on the preceding, the student's intellect and personality have many reserve capabilities for effective foreign language acquisition in intensive learning. For the teacher, it is crucial to select adaptive technologies appropriately based on each student's group and individual characteristics. At the same time, educational institutions need to implement specific actions to support existing motivation and identify personal student traits that actively influence the learning process.

The studies conducted both in our country and abroad (mainly focusing on adaptive informational systems) differ in their views on the effectiveness of the adaptive approach. It remains unclear whether this is due to research limitations or the current state of development of adaptive technologies, as the adaptive approach is still in its early stages. However, this method has demonstrated its effectiveness for students with certain levels of knowledge, skills, language abilities, and motivation within the scope of learning any foreign language.

## Ethical considerations

Not applicable

## Conflict of Interest

The authors declare no conflicts of interest.

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