CONTENTS
COMPUTER SCIENCE:SOFTWARE ENGINEERING

MULTIMEDIA TECHNOLOGIES: PEDAGOGY AND PSYCHOLOGY

MATHEMATICAL MODELING AND CALCULATION METHODS

APPLIED MATHEMATICS AND COMPUTER SCIENCE

INFORMATION TECHNOLOGIES IN EDUCATION

Agricultural production planning and problem solving using MS Excel

Keneshbek Maatov [1] orcid: 0000-0003-7374-6061
e-mail: Maatov.k.m@gmail.com

Zhoomart Mambetov [2] orcid: 0000-0003-4455-5887
e-mail: Zhoomart_mambetov@mail.ru

Tynybek Naraliev [3] orcid: 0000-0003-8243-5653
e-mail: naralievtynybek470@gmail.com

https://doi.org/10.5281/zenodo.14752406

[1.2]Osh Technological University named after M. Adyshev, Osh, Kyrgyzstan

[3]Osh State University, Osh, Kyrgyzstan

Abstract. The article examines the issue of meeting the agricultural production needs of a hypothetical enterprise for the planned period through internal production and the import of products from other enterprises. A mathematical model of optimizing agricultural production and its importation at minimal total costs is formulated. To verify the effectiveness of the formulated model, a specific example is presented and solved using the Solver add-in in Excel.

Keywords: mathematical model, costs, production, wholesale prices, set, arable land, optimization, agricultural products, MS Excel.

1 Introduction

In contemporary times, agriculture perseveres as a pivotal sector within the global economy, serving as a cornerstone for both food security and industrial raw material provision. Proficient planning of agricultural production stands as an indispensable element in fostering the consistent advancement of this domain. Leveraging modern tools, notably Microsoft Excel, substantially streamlines this procedural intricacy, thereby facilitating the attainment of optimal outcomes.

In the modern stage of agricultural development, the role of expanding market access significantly increases, viewed as an indispensable condition for attracting investments in the technical and technological modernization of the sector, enhancing employment, and augmenting revenues for budgets at all levels. Presently, pivotal points of sales growth in agricultural products and the agrarian sector of the national economy as a whole are logistics centers - hubs that shape commodity transport flows at national, regional, and local levels, stimulating the processing of agricultural produce. In [1], the assessment of the role of logistics centers in the agricultural sector and their influence on product competitiveness (using the example of the Southern region of Kyrgyzstan) is examined, along with the necessity for investment planning for the creation of a logistics center with the involvement of the Kyrgyz-Russian Fund.

In [2], a mathematical model is formulated for determining the technological method of agricultural production for an agricultural firm, allowing for the maximization of income. A specific example is considered, and the solution is obtained using a program written in Pascal language.

Theoretical foundations of production efficiency in agriculture, particularly in the Kyrgyz Republic (KR), are examined in [3]. The subjects of agricultural production in the KR are the focus of the study. Theoretical aspects

are refined based on a synthesis of existing perspectives from predecessors on this issue, clarifying the concepts and specific features of production efficiency in agriculture. In the current stage of agricultural economy development worldwide, especially in developing countries including Kyrgyzstan, the issue of agricultural production efficiency becomes increasingly acute and relevant. The urgency and relevance of this issue, as well as its formulation, primarily indicate that the republic possesses a sufficient level of potential in the agricultural sector. Only through rational resource utilization, application of intensive technologies, and consequent enhancement of production efficiency can sustainable growth rates of production and steady improvement in the material and cultural standards of rural inhabitants be ensured.

For the effective operation of the agricultural sector within market environments, attaining the rational utilization of existing resources is imperative, extending beyond the confines of agriculture itself to encompass closely associated industries. In [4], avenues for enhancing the management of agriculture in the Kyrgyz Republic are explored. The study focuses on agricultural entities within the Kyrgyz Republic, conducting a thorough investigation into specific challenges, exemplified through peasant and farm households. The research elucidates the motives driving agricultural production management within Kyrgyzstan's local governing bodies and proposes fundamental strategies to augment the economic efficiency of agricultural production.

The aim of research work [5] is the systematic examination of the theoretical foundations and practical challenges of agrarian reform within the context of evolving market dynamics, alongside the development of practical recommendations and methodological frameworks for their implementation in the conditions of the Kyrgyz Republic. The subject and object of the research encompass a set of organizational and economic issues associated with the formation of agrarian reform. Throughout the study, methods such as systems analysis, economic-statistical analysis, monographic analysis, and comparative methods were employed. The research findings consolidate and deepen theoretical insights pertaining to agrarian sector reform and its impact on the country's economy.

Works [8-11] are dedicated to the planning of agricultural production and the resolution of various tasks using MS Excel.

In this study, methods of agricultural production planning using MS Excel are explored, and the applicability of this tool for addressing specific tasks in the agricultural sector is investigated. The results of works [6-7] are utilized in this study.

2 Methodology

Formulation of the problem. Let a conditional enterprise A_0 have a sown area of various categories in the amount of s_0^l, $l \in L_0 = \{1, 2, \dots, L_0\}$, where they can be used for the production of k – types of agricultural products, $k \in K = \{1, 2, \dots, p\}$. Based on long-term data, we believe that the yield of each agricultural product by category of sown area is known. The enterprise's needs for various types of products for the planned period amount to q_0^k, $k \in K$.

In addition, the enterprise has trade-economic relations with other similar enterprises A_i, $i \in I = \{1, 2, \dots, m\}$ and, if necessary, can purchase agricultural products from them A_i, $i \in I$.

The costs of an enterprise for the production of a unit volume of each type of product on cultivated areas of various categories c_l^k, $k \in K$, $l = 1,2,\dots,L_0,$, , procurement, and transportation costs c_{i0}^k, $k \in K$ per unit volume of each type of purchased product from each similar enterprise are known A_i, $i \in I$.

It is necessary to determine the optimal volume of products produced in the enterprise and purchased from A_i, $i \in I$ each type of product so that the total costs of production and purchase of products would be minimal and at the same time, the needs of the enterprise would be fully satisfied.

Having introduced several notations, we compose the mathematical problem for this problem:

l – index of sown areas of various categories $l \in L_0$;

5

i – index of similar enterprises having trade and economic relations

A_i, $i \in I = \{1,2,...,m\}$; ;

k – index of the type of product required for the enterprise $k \in K = \{1,2,..., p\}$;

Known parameters:

s_0^l – And the size of the **l-** category of planting area of the enterprise is known parameters: $l \in L_0$;

q_0^k – volume of demand for the **k**-type of product for the planned period of the enterprise $k \in K$;

a_l^k – productivity of the **k-** agricultural product (in tons) per unit of the **l-** category of sown area, $k \in K, l \in L_0$;

c_{i0}^k – procurement and transportation costs of the enterprise per unit volume of products of the **k**-type from other similar enterprises A_i, $k \in K, i \in I$;

c_l^k – production costs of the enterprise per unit volume of products of the **k-** type, $k \in K, l \in L_0$.

Searched variables:

x_l^k – size of the l- category of sown area for the k- type of agricultural products $k \in K, l \in L_0$;

y_{i0}^k – volume of imported products of the k- type, $k \in K, i \in I$.

Using the above notations and taking into account the goal, a mathematical model of the task is compiled:

$$G(x,y) = \sum_{k \in K_0} \sum_{l \in L_0} c_l^k x_l^k + \sum_{k \in K} \sum_{i \in I} c_{io}^k x_{io}^k \rightarrow \min \qquad (1)$$

subject to restrictions $\sum_{k \in K_0} x_l^k \leq s_o^l, \quad l \in L_o$ \qquad (2)

$$\sum_{l \in L_0} a_l^k x_l^k + \sum_{i \in I} y_{io}^k = q_o^k, \quad k \in K, \qquad (3)$$

$$\sum_{l \in L_0} a_l^k x_l^k \leq q_o^k, \quad k \in K_o, \quad (4)$$

$$x_l^k \geq 0, \quad k \in K, \; l \in L_o, \quad (5)$$

$$y_{io}^k \geq 0, \quad k \in K, \; i \in I, \qquad (6)$$

где $x = \left| x_l^k \right|_{|L_o \| K_o|}, \quad y = \left| y_{io}^k \right|_{|I \| K|}$

Problem (1)-(6) is a special case of the extremal problem considered in [1].

Let's look at an example. Let the enterprise have a cultivated area of 100 hectares, which consists of four categories of land, i.e.. $s_o^l = \{s_o^1, s_o^2, s_o^3, s_o^4\} = \{24, 22, 26, 28\}$

The region's need for three types of crops (in tons) is q_o^k, $k = 1,2,3$, i.e. $q_o^k = \{q_o^1, q_o^2, q_o^3\} = \{420, 200, 400\}$.

The yield per unit of sown area from each category of land is given in the form of a matrix a_o^k, $k = 1,2,3$, $i = 1,2,3,4$, т.е.:

$$\left| a_l^k \right|_{4,3} = \begin{pmatrix} 6 & 4 & 16 \\ 7 & 3 & 17 \\ 5 & 3 & 14 \\ 4 & 2 & 10 \end{pmatrix}.$$

The costs of growing the k- type of agricultural product per unit size of sown area are known, depending on the category of land c_l^k, $k = 1,2,3$, $i = 1,2,3,4$, (som/ha) i.e.:

$$\left| c_l^k \right|_{4,3} = \begin{pmatrix} 32250.0 & 30950.0 & 12125.0 \\ 29950.0 & 33100.0 & 14100.0 \\ 34500.0 & 37450.0 & 21120.0 \\ 38200.0 & 42300.0 & 41200.0 \end{pmatrix}.$$

Also known are the purchase and transportation costs of the c_{io}^k k- type of agricultural products from A_iBA_o, k=1,2,3, i=1,2,3, i.e.:

$$\left| c_{io}^k \right|_{3,3} = \begin{pmatrix} 11000 & 12000 & 40000 \\ 9000 & 10000 & 2500 \\ 10000 & 9000 & 3700 \end{pmatrix}.$$

By the above data, the mathematical model of the problem will be written in the form.

Find the minimum

$$G(x,y) = 32250.0x_1^1 + 30950.0x_1^2 + 12125.0x_1^3 + 29950.0x_2^1 + 33100.0x_2^2 +$$

$$+ 14100.0x_2^3 + +34500.0x_3^1 + 37450.0x_3^2 + 21120.0x_3^3 + 38200.0x_4^1 + 42300.0x_4^2 +$$

$$+ 41200.0x_4^3 + 11000.0y_{10}^1 + 12000.0y_{10}^2 + 4000.0y_{10}^3 + 9000.0y_{20}^1 + 10000.0y_{20}^2 +$$

$$+ 2500.0y_{20}^3 + 10000.0y_{30}^1 + 9000.0y_{30}^2 + 3700.0y_{30}^3$$

(7)

under conditions

$$\sum_{k=1}^{3} x_1^k \le 24, \quad \sum_{k=1}^{3} x_2^k \le 22, \quad \sum_{k=1}^{3} x_3^k \le 26, \quad \sum_{k=1}^{3} x_4^k \le 28, \qquad (8)$$

$$6x_1^1 + 7x_2^1 + 5x_3^1 + 4x_4^1 + \sum_{i=1}^{3} y_{i0}^l = 420.0 \qquad (9)$$

$$4x_1^2 + 3x_2^2 + 3x_3^2 + 2x_4^2 + \sum_{i=1}^{3} y_{i0}^2 = 200.0, \qquad (10)$$

$$16x_1^3 + 17x_2^3 + 14x_3^3 + 10x_4^3 + \sum_{i=1}^{3} y_{i0}^3 = 400.0, \qquad (11)$$

$$6x_1^1 + 7x_2^1 + 5x_3^1 + 168x_4^1 \le 420.0, \qquad (12)$$

$$4x_1^2 + 3x_2^2 + 3x_3^2 + 2x_4^2 \le 200.0, \qquad (13)$$

$$16x_1^3 + 17x_2^3 + 14x_3^3 + 10x_4^3 \le 400.0, \qquad (14)$$

$$x_l^k \ge 0, \quad l = 1,2,3,4, \quad k = 1,2,3, \qquad (15)$$

$$y_{io}^k \ge 0, \quad i = 1,2,3, \quad k = 1,2,3,4, \qquad (16)$$

где $x = \left| x_l^k \right|_{4,3}, \quad y = \left| y_{io}^k \right|_{3,3}.$

Having solved problem (7)-(16) using the "Solution Search" add-in in Excel [2], we obtain an optimal production plan in A_0 and a plan for the purchase of agricultural products from similar enterprises A_i, $i=1,2,3$, with which we have trade-economic relations, i.e.:

$$X^* = \left\{ x_1^3 = 24.0, \ x_2^1 = 22.0, \ x_3^1 = 24.86, \ x_3^3 = 1.143, \ x_4^1 = 28.0 \right\},$$

$$y^* = \left\{ y_{20}^1 = 29.71, \qquad y_{10}^3 = 200.0 \right\},$$

where the objective function has a value

G(x*,y*)=4968637.143 som.

From the optimal solution to the problem it follows that enterprise A_0, to meet the population's needs for agricultural products for the planned period, must allocate from the first category of sown area in the amount of $x_1^3 = 24.0$ hectares for the third type of agricultural products, from the second category of sown area in the amount of $x_2^1 = 22.0$ hectares for the first type of agricultural products, from the third category The sown area should be allocated in the amount of $x_3^1 = 24.86$, $x_3^3 = 1.143$ hectares. respectively, for the first and third types of agricultural products. From the fourth category, the sown area in the amount of $x_4^1 = 28.0$ hectares should be allocated for the first type of product.

It is clear from the decision that the production of agricultural products of the first and second types from the first and second categories of land is more expensive than imported ones. In this regard, it is recommended to meet

the demand of enterprise A_0 for this type of agricultural product with imported products from A_{20} and A_{30} in the amount of $y_{20}^1 = 29.71$ and $y_{10}^2 = 200.0$ tons

With this plan, the total costs of the enterprise A_0 are

G(x*,y*) =4968637.143 som.

Thus, the formulated mathematical model can be used by relevant departments to plan agricultural production.

3 Conclusion

The article presents a mathematical model for meeting the agricultural production needs of a hypothetical enterprise over a planned period through internal production and import of products from other enterprises. A specific example is provided. In solving the problem, the MS Excel spreadsheet was utilized. The use of MS Excel in agricultural production planning helps agricultural enterprises efficiently manage resources, minimize risks, and achieve optimal results. Thus, the formulated mathematical model can be used by relevant authorities for planning agricultural production.

References

1. Umarov, S.T. Assessment of the role of logistics centers in the agricultural sector and their impact on product competitiveness using mathematical decision-making methods (on the example of the Southern region of Kyrgyzstan) / S.T. Umarov, K.M. Maatov // Economics and Innovation Management. – 2020. – No. 1(12). – P. 83-93.
2. Zhusupbaev, N.A. Determination of the technological method of agricultural production for a farm based on the criterion of maximum income / N.A. Zhusupbaev, Zh. Turganbayeva, K. Maatov // Bulletin of the Institute of Mathematics of the National Academy of Sciences of the Kyrgyz Republic. – 2018. – No. 1. – P. 163-168.
3. Abdiev M.J. Improving management in agriculture of the Kyrgyz Republic / M. J. Abdiev, K. M. Maatov // Economy And Business: Theory And Practice. – 2017. – № 2. – C. 4-7.
4. Mametova, G.A. Theoretical foundations of production efficiency in agriculture / G.A. Mametova, K.M. Maatov, K.A. Ergeshov // Economics and Business: Theory and Practice. – 2017. – No. 2. – P. 56-60.
5. Ergeşov, K.A. Features of agrarian reform in the Kyrgyz Republic in market conditions / K.A. Ergeşov // Science. Education. Technology. – 2017. – No. 1(58). – P. 23-26.
6. Asankulova, M., Zhusupbaev, A. Optimization of extraction and distribution of raw materials among consumers depending on the period // Problems of modern science and education. 2016. No. 4 (46). P. 7 – 12. ISSN 2304-2338 (print version), ISSN 2413-4635 (electronic version)
7. Asankulova, M., Zhusupbaev, A., Zhusupbaev, G.A. Determination of the maximum income of the enterprise with limited financial resources // Current directions of scientific research of the XXI century: Theory and Practice. 2015. Vol. 3. No. 7 part 1(18-1). P. 101 – 105.
8. Asankulova, M. Determination of the optimal size of the sown area for agricultural crops of the farm / M. Asankulova, N.K. Suinalieva, K. Maatov // Bulletin of the Institute of Mathematics of the National Academy of Sciences of the Kyrgyz Republic. – 2018. – No. 1. – P. 37-43.
9. Ashirbaeva, A.Zh. Solving the integer programming problem using MS Excel / A.Zh. Ashirbaeva, K.A. Abdizakir // Proceedings of the Osh Technological University. – 2020. – No. 1. – P. 152-155.
10. Kultaev, T.Ch. Ways to improve the efficiency of processing enterprises of agricultural products in the Kyrgyz Republic / T.Ch. Kultaev, K.K. Toktorov // Proceedings of the Issyk-Kul Forum of Accountants and Auditors of the Central Asian countries. – 2020. – No. 3(30). – P. 77-82.
11. Maatov, K.M. Determination of the optimal volume of production and its leasing in the cotton industry / K.M. Maatov // Bulletin of Jalal-Abad State University. – 2023. – No. S2(55). – P. 135-141.

Adapting and Supplementing English Textbooks for National Context

Dilafruz Abdurashidova orcid: 0009-0006-8319-709X
e-mail: dilafruzJalil@gmail.com

EFL teacher, English language and literature, University Tashkent for Applied Sciences,
Gavhar Str. 1, Tashkent 100149, Uzbekistan

Abstract: The aim of this work is to analyse how much the market trend textbooks are suitable to different contexts, particularly Uzbek national context. Due to the limitation of research methods, to cover every aspect of the study and save time, energy, and funding, one of the most effective approaches – a triangular approach was employed: incorporating investigation, observation, and questionnaires. The initial phase involved scrutinizing various course materials to assess their suitability for facilitating real-life conversations, aligning with learners' linguistic capabilities, and achieving the i+1 model as proposed by Krashen. Subsequent visits to learning centers enabled direct observation of classroom dynamics and facilities, while engaging in discussions with educators provided insights into their strategies for fostering communicative lessons. Employing a questionnaire proved efficacious, not only for collecting data but also for streamlining the research process. The results showed that adaptation is the aspect of textbook evaluation that is too important to neglect. Therefore, adaptation and supplementation must be carried out by any means necessary.

Key words: Textbook, adaption, supplementation, national context, textbook evaluation, triangular approach, adaptability, appropriateness, students' autonomy.

1. Introduction

In the realm of English language education, the adaptation and supplementation of textbooks for national contexts is a crucial and multifaceted endeavor. This article delves into the intricate process of tailoring English textbooks to suit the specific needs and nuances of diverse educational landscapes. From considerations of culture and students' preferences to the influence of government policies and the overarching aims of learning English, a myriad of essential aspects come into play. Furthermore, the selection of text topics and the alignment with students' proficiency levels are pivotal in ensuring effective language acquisition. This study aims to explore the challenges and opportunities inherent in adapting and supplementing English textbooks for national contexts, shedding light on current practices and proposing future directions for enhancing the quality and relevance of English language education.

2. Methods

2.1 Subject of the study

For this project, a group of 11 EFL learners has been selected. Their age ranges from 18 to 23, and in this regard, most of them are enrolled in their bachelor studies in local universities while only two of them are already graduates. By gender, they are all cisgenders, and the number of female students is five while the other six students are male. By family status, they are all single. When it comes to their nationality, there are seven Uzbek, two Russian, a Tajik and an Armenian student studying English together. In this regard, their language background is also quite diverse. Russian language is either first or second language for all the students while Uzbek, Tajik and Armenian is the native language for seven students, a student and a student respectively. Moreover, the Armenian

and Tajik student are also fluent in using Uzbek language since it is another home language for them. To be more precise, their fathers are Uzbek, and they use Uzbek at home to talk with their fathers.

Regarding the context where they are learning the target language, Registan, a language center located in Shukhrat Street, Chilanzar district, Tashkent, is a study place for them to take private English courses to prepare for the IELTS exam. In the center, lessons are held 3 times a week, and each lesson lasts for 2hours. All the language skills are integrated in class activities to help learners to be prepared for the exam test materials. As for the language teaching methods, CLT and TBLT are implemented during the classes with the help of several communicative and collaborative tasks like role-plays, discussions and group projects.

With regards to the prior English language learning experiences, all the students took only private group sessions to learn the English language apart from their formal education at school where they learnt the basics of English. Therefore, it is better to divide their learning experience into two phases like passive and active. Regarding the passive learning experience, they have been learning English for over a decade while they have been studying English actively for the last 2 years.

When it comes to the way how instruction was provided, the students were mostly taught using the deductive way of teaching since they were explicitly provided with rules and patterns by their instructors before they were engaged in applying language forms. According to Chalipa (2013), deductive language teaching is mostly applied in teacher-centered classrooms as language instructors play an important role in the language task accomplishment and explain everything to their learners where in inductive teaching, students need to deduce the rules and patterns themselves using the noticing skills. For the last few months, their instruction has been shifted from deductive one into inductive one.

Regarding the instructional practices, they were involved in doing grammar tests, translating English texts into Uzbek, or learning a long list of new words after copying them isolated into their notebooks, which aligns with the elements of GTM according to Brown (2014). Moreover, they have been taught using CLT in the last two years since they have been encouraged to apply language forms in meaningful interactions. As Savignon (1991) highlighted, CLT is student-centered and provides learners with opportunities for authentic language use. During their studies in the last two years, the students were involved in several communicative tasks to demonstrate their language skills in context throughout different activities like role-plays, discussions, and presentations. In this sense, the focus of the English lessons the learners had shifted from grammar, vocabulary and reading to speaking and listening.

In terms of their current levels, students were assessed based on their recent achievement test which comprised of all the language skills along with grammar and vocabulary parts. According to the results, the students' level is about pre-intermediate now. It can be observed in their language practices as well since they are able to comprehend a bit longer texts or audios and talk about familiar situations, which aligns with the CEFR standards.

Nowadays, the learners are involved in improving all of their language skills not overlooking the significance of grammatical structures and vocabulary parts. For instance, students learn grammar in an inductive way since they need to deduce the rule themselves, and the textbook they use in the class comprise various grammatical units. Likewise, during the classes, their language skills are focused through meaningful tasks, and they need to demonstrate their comprehending and application by interacting with others. However, language activities are not simply selected and used in the classroom (Macalister, 2016). Therefore, most language materials are adapted or supplemented to meet the needs of learners. For example, prior to applying any teaching material in the classroom, the content or the instruction of these materials are usually modified and changed to match with the learners' identities, needs, age, and level since it is important to consider their sociolinguistic background to provide better language resources (Savova, 2018).

As for the motivation, the students in this group have different motivation types. Some of the students enjoy the process of learning English language, which can consider as intrinsic motivation or learning the language for its own sake (Dornyei, 2014). However, all the students have the purpose of continuing their studies in various degrees and they need to show their decent English proficiency levels; therefore, they are learning the target language.

According to Dornyei (2014), extrinsic motivation is linked with the learners' purposes of achieving better grades or getting a good job, which can also be observed in the selected students.

Regarding their investment, it is important in achieving better linguistic results to be able to communicate effectively in the target language, and it implies the amount of time, money and effort spent on learning the language (Darvin & Norton, 2015). In this sense, the learners invest enough time to work on their language skills while the financial investment is also worth considering since they are taking private courses to improve their communicative competence in the target language. Thus, their efforts put in learning the target language is sufficient.

As for the strengths of the learners, some students are good at expressing their ideas freely since they do not have any anxiety while others feel hesitated to talk in front of the others due to their personality. According to Moody (1988), personality types can also influence on the language learning process. Moreover, some students have better comprehension in reading while other students can understand better if it is provided in an audio format. However, all the students have some problems in their grammatical knowledge use.

2.2 Methods

To delve into the very topic triangular approach is chosen: research, observation, and questionnaire. First, several course books were investigated to determine whether students can have conversations on real-life topics, the level of activities and texts are appropriate for learners' linguistic abilities and background knowledge to promote i+1 approach suggested by Krashen and to meet students' needs and lacks. By visiting to LCs to get familiar with learning situations and observe classes, the data about learning facilities and atmosphere of classroom was gathered. It is also vital to have a talk with teachers and instructors what they consider before their class to make lesson communicative. For this reason, making a questionnaire can be seen as an effective tool not only because it helps to gather data but also it saves time and energy.

3. Results

For the study of textbook adaption and supplementation, Speak out Pre-intermediate Student's book second edition (2015), by Pearson Education Limited has been chosen. Regarding the textbook evaluation, the unit about "Travel" given in the book is organized in an appealing and attractive way as the coloring does not distract the learners. Moreover, the reading level is suitable for the learners' age since they do not have any problems to come up with ideas to contribute to the lesson activities performance. As for the instructions given in the unit, they are all clear to guide learners to accomplish the task effectively. With regards to the content, authentic situations are incorporated with the help of a wide variety of activities that are suitable for learners' needs and level. Besides that, the use of non-textual materials including pictures and graphics is effective and the content does not have any errors in terms of grammar, spelling, and punctuation. Several activities are integrated to address diverse learning abilities like visual and auditory learning styles and thus content is relevant and relatable for the students. When it comes to the inclusion and equity in the unit materials, both genders are featured in equally important roles and written content and pictures include individuals of various cultures and social backgrounds. Any stereotypes or offensive language forms are not spotted.

Activity 1. Pair discussion (p.48)

According to Tomlinson's (2011) principles of materials designing, this activity can enable pre-intermediate students to foster their cognitive engagement since they need to generate ideas about the types of transport. Moreover, as the task is not too complicated and does not require any complex language uses, it can be encouraging for students to discuss in pairs to build interaction using their communication skills. Additionally, as the task has a certain time limit along with clear instructions on what to do, it can be helpful for language learners to gain confidence in their abilities throughout the process. As the focus is on types of transport, it can provide relevance and authenticity since students come across applying transport types in their everyday speech, which can enable them to reflect on their background knowledge on transport. Furthermore, as the activity requires language learners to contribute to the task performance by generating and sharing their ideas, it can be stimulating for self-investment of students by taking responsibility of their learning and engaging in purposeful interaction with their peer.

However, as the task does not introduce new linguistic features explicitly and it puts great emphasis on activating students' prior knowledge, it can be a bit challenging for those who have problems in vocabulary or grammar use or cannot express their reasons in a coherent way. In this manner, the task does not draw learners' attention to a certain linguistic feature as it mainly aims to enable students to generate ideas and express them rather than dissecting language structures. Therefore, regarding the needs of my students who have linguistic problems in vocabulary and grammar use along with their challenges in speaking, I would supplement this task to meet their needs. According to McGrath (2016), not a single book necessarily always addresses the needs of certain learners, supplementation or adding something new to meet the needs can be a best option once a language instructor has recognized the deficiencies in the existing materials to use their own class. As I mentioned above, my learners have certain linguistic challenges and the task is not fully suitable for them, I suggest supplementing it by adding several scaffolding elements like providing them with a worksheet of transport types and sentence starters. This can be done by either using pre-existing materials or designing one's own linguistic resources, as emphasized by McGrath (2016).

Activity 2. Jigsaw reading (p.48)
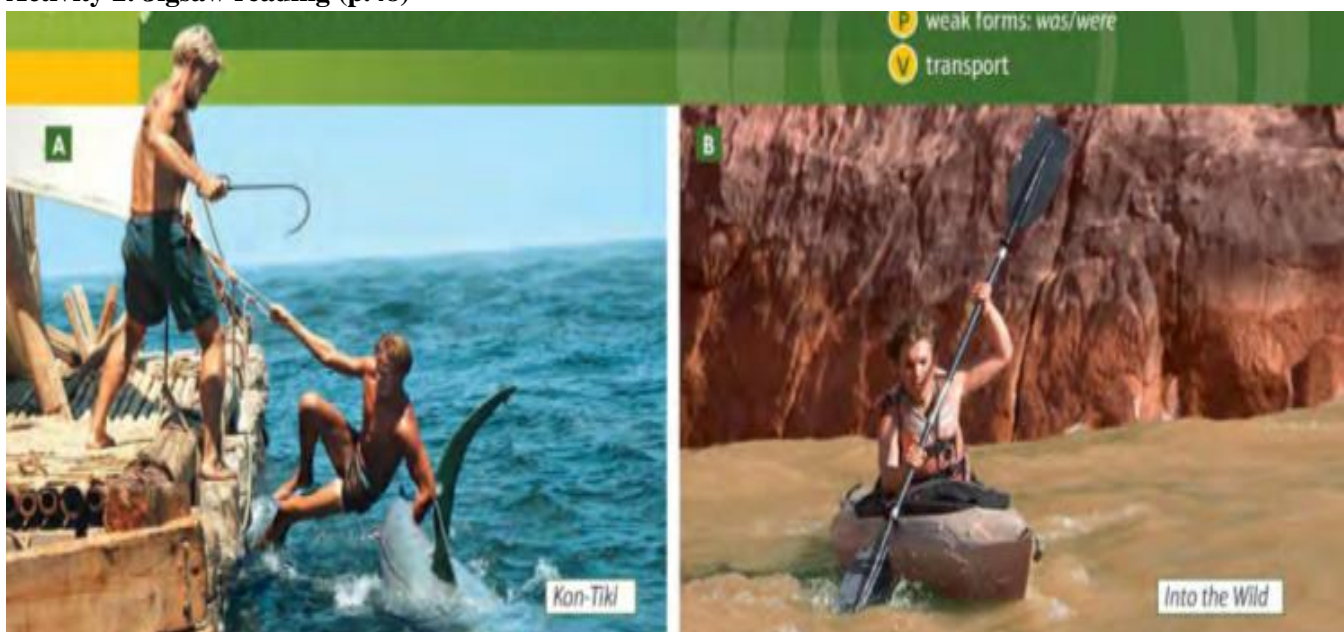
READING

2 Work in pairs. Look at photos A–C and discuss the questions.

   1 What types of transport do you think appear in the films above?
   2 Where do you think the people are going?

3 Work in groups. Student A: read the text on this page. Student B: read the text on page 161. Student C: read the text on page 163. As you read, make notes about your text.

   1 Who made the journey?
   2 Why did they want to go?
   3 Where did they go?

4 Take turns to tell your group about your text. Which story do you think sounds the most interesting?

KON-TIKI

In the middle of the twentieth century the Norwegian explorer and writer Thor Heyerdahl developed a theory. He believed that people from South America travelled to Polynesia 1,500 years ago and settled there. At the time, very few others believed his theory. They thought the journey was too difficult without modern technology. While others were discussing the theory, Heyerdahl decided to test it.

Using only materials and technology available to the people of that time, Heyerdahl and his team of five sailors (and a parrot) built a wooden raft*. On 28 April 1947 they left from Peru and crossed the Pacific.

While they were sailing, huge waves crashed into the raft, and whales and sharks came close. 101 days and 4,300 miles later they arrived in Polynesia. At the time, no one knew this type of journey was possible. But perhaps the most amazing thing about the journey was that Thor Heyerdahl didn't know how to swim!

Heyerdahl later wrote a book about the journey, and in 2012 a Norwegian film called *Kon-Tiki* came out, based on the trip.

*raft: a flat boat usually made of wood

To evaluate this activity, I applied Ellis's (2005) principles and found out that it only aligns with certain ones while a few principles like focus-on-form, individual differences and comprehensive language assessment are left intact while developing this activity. Regarding the alignments, as the activity requires students to discuss transport types and travel destinations based on the given photos, it can clearly focus more on meaning-based communication (Principle 2). Moreover, the activity gives chances for learners to produce oral output since they are engaged in pair and group discussions to share their ideas and notes (Principle 7). Furthermore, due to the pair and group-work manner, the activity can encourage interaction in the target language among students (Principle 8).

However, the activity does not focus on developing students' competence in using formulaic expressions or rule-based language production since they simply discuss the transport types and travel destinations, which can be non-alignment to Principle 1 whereas it does not involve focus-on-form, which is against Principle 3. Likewise, even though Principle 5 and 9 highlighted the significance of considering individual learner needs or preferences accordingly, the activity does not address specific needs of language learners. Moreover, the activity does not include any assessment of learners' proficiency either in a controlled or free manner, which can be against Principle 10. To eliminate these materials designing issues, I would suggest adapting this activity to the needs of the participant-learners in this project.

According to Macalister (2016), adapting existing sources can optimize language learning as it is possible to address the highlighted weak areas in the activity evaluated above with the help of answering several questions regarding what and in what order to teach, how to teach and how to assess in a formative way. Moreover, the changes can be done in several modes like content and sequencing, format and presentation, and monitoring and assessment (Macalister, 2016). As proper sequencing can be scaffolding for the learners while a change in format and presentation can address their individual differences, or monitoring and assessment can give better on-going image of the learners' progress throughout the activity. By doing this, the existing activity can be adapted to meet the needs and preferences of my learners.

Activity 3. Grammar (p. 49)

GRAMMAR

PAST SIMPLE AND PAST CONTINUOUS

6 A Look at sentences a)–c) and answer the questions.

a) While they **were sailing**, huge waves **crashed** into the raft.

b) While he **was living** wild, he **wrote** a diary.

c) When it **was raining**, the girls **decided** to escape.

1 What tenses are the verbs in bold?

2 Which action started first in each sentence (*sail* or *crash*, etc.)?

3 Which action took a longer period of time?

4 Which actions are background information and which are main events?

B Underline the correct alternative to complete the rules.

> **RULES**
>
> 1 Use the *past simple/past continuous* for background actions that continue for a long time.
>
> 2 Use the *past simple/past continuous* for shorter actions that move the story forward.

C Find one more example of the past simple and the past continuous in the same sentence in your text.

I used comparatively less detailed principles to evaluate this activity. Based on Bell and Gower (2011, in Tomlinson, 2011, pp. 135-150), it aligns with some principles. As for the flexibility, the activity does not hinder a language instructor from selecting and re-ordering the sentences according to the preferences. Moreover, as the grammatical point is treated inductively since students are asked to identify the usage patterns of the tenses without explicitly being given rules or explanations, which can infer to an inductive approach to grammar teaching. This can also foster natural language and emphasis on review since students need to dissect and identify tense use in context.

However, the provided sentence for analysis is necessarily taken from authentic texts but rather constructed for focus-on-form purpose. Furthermore, not all the students can be engaged in the activity since it focuses on dissecting the tense uses paying attention to their structure, and not other language skills except reading at the last point have been integrated. It would be better to prioritize the reading texts to provide additional contextualization to make the activity more interesting and engaging for learners. Moreover, the activity does not address metacognitive skills development or "learning how to learn" skills since students do not reflect on their learning experience and realize that the knowledge can be applied outside the classroom by exploring various learning strategies or resources. Therefore, I would suggest adapting this task to meet the needs of the learners.

As Macalister (2016) mentioned, it is important to address the lacks and necessities in the language materials. It is true that the learners have problems in using certain tenses like past continuous and past simple, yet it should be taught in an interactive way by incorporating other language skills. Moreover, by adapting the format and presentation, the learners can take better advantages over the task since their needs can be addressed in an appropriate way by engaging them in a more authentic way. Additionally, as Nation and Macalister (2010) noted, it is important to provide students with feedback on their language learning by considering their on-going needs and environment analysis. In this regard, they can progress better in their language learning.

Activity 4. Guided practice (p.49)

9 Work in pairs and take turns. Student A: make sentences with the past simple and the past continuous. Use a prompt from A and a prompt from B. Student B: respond with another sentence beginning with *So … .*

A: *I was sleeping in my bed when I heard a strange noise.*
B: *So I called the police.*

A: sleep / ride my motorbike / *deal with a problem* / go for a drink

B: get hungry / buy a speedboat / *crash* / decide to change job

feel sick / go to a concert / make a call / *sit in a train* / have some time off / watch a film

start to feel tired / fall asleep / **see the love of my life** / *check my voicemail* / read your email / **hear a strange noise**
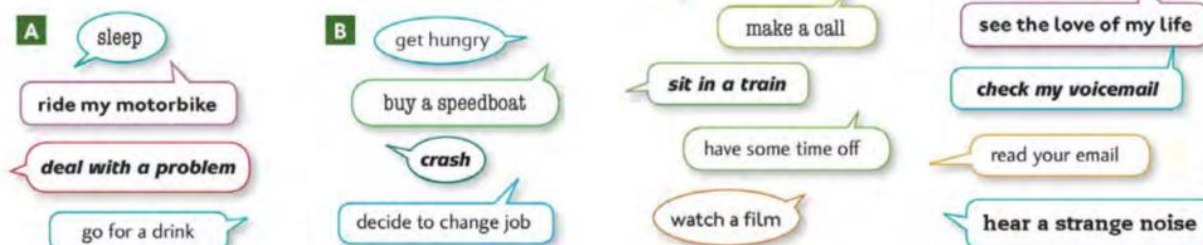
This activity aligns with the principles proposed by Tomlinson (2011). First, as it provides an interactive way of applying the forms on focus, learners can develop their grammatical understanding in an engaging and authentic way. Second, as the students are involved in pair work, it can give them a more comfortable and supportive environment for using language forms by collaborating and building confidence, which is also important in materials designing. Moreover, as the activity focuses on the practical use of two tenses, the students can realize the value and benefits of being able to accurately use grammatical forms. Additionally, as students create their own sentences based on the prompt ideas, they are sufficiently encouraged to invest in their own learning by constructing meaningful language use. As the learners have been taught the structures of the past simple and past continuous in the previous tasks, they are ready to apply their gained knowledge in communicative context, which can ensure the authenticity as well. Furthermore, as the explicit focus is on the use of two tenses, it can be said that the learners' attention is directed towards a certain linguistic form or structure. Besides that, students are provided with enough communicative opportunities to be involved in meaningful exchange with their peer, which is also important to maintain interaction and authenticity. In this regard, I would select this activity to use for my learners.

As my learners have problems in applying grammatical forms in use and lacks speaking abilities, this activity can address these issues in an effective way. As Tomlinson (2011) highlighted, the importance of making students feel at ease is also important in developing lesson materials and if the students are too challenged in addressing task specifications, they may easily lose their motivation to continue learning. Moreover, language materials designed by taking the specific needs into account can help students gain confidence and facilitate their self-investment in the task. In this regard, as mentioned above, the given task is suitable for the needs of the selected learners.
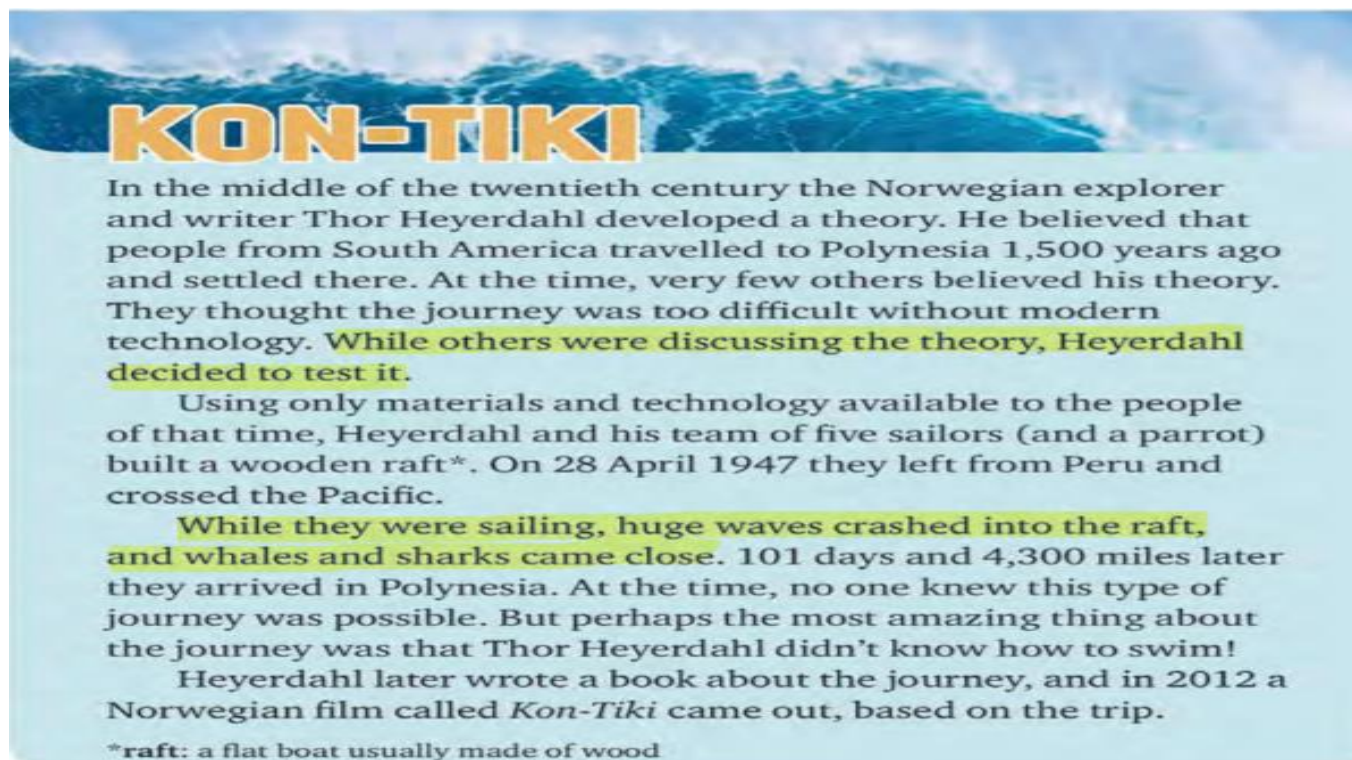
4 Discussion

Adapt or Supplement

To adapt Activity 3, I would suggest the following outline:

1. Pair students up.
2. Give a text to them.
3. Ask them to read and pay attention to the bolded language forms.
4. Assign students to discuss the use of the structures in pairs.
5. Give pairs a worksheet to fill.
6. Ask pairs to answer certain questions in their discussion and fill in the worksheet with their ideas.
7. Ask students to make their own sentences using the forms.
8. Ask each pair to present their worksheet notes and new sample sentences.
9. Encourage students to provide feedback on other students' explanation and sentences.

The chosen text

KON-TIKI

In the middle of the twentieth century the Norwegian explorer and writer Thor Heyerdahl developed a theory. He believed that people from South America travelled to Polynesia 1,500 years ago and settled there. At the time, very few others believed his theory. They thought the journey was too difficult without modern technology. While others were discussing the theory, Heyerdahl decided to test it.

Using only materials and technology available to the people of that time, Heyerdahl and his team of five sailors (and a parrot) built a wooden raft*. On 28 April 1947 they left from Peru and crossed the Pacific.

While they were sailing, huge waves crashed into the raft, and whales and sharks came close. 101 days and 4,300 miles later they arrived in Polynesia. At the time, no one knew this type of journey was possible. But perhaps the most amazing thing about the journey was that Thor Heyerdahl didn't know how to swim!

Heyerdahl later wrote a book about the journey, and in 2012 a Norwegian film called *Kon-Tiki* came out, based on the trip.

*raft: a flat boat usually made of wood

Worksheet:

Questions	Notes
What is the structure?	
When to use this structure?	
How to use this structure?	
Which is a longer action?	
Which is a shorter action?	
Make your sample sentences	

To justify the changes, I compare the adapted and existing activity based on the principles proposed by Bell and Gower (2011, in Tomlinson, 2011, pp.135-150). As in the adapted version of the activity, students are paired up to give more interactional chances and instead of the isolated sentences extracted from the context, students are given a whole context and drawn their attention to the forms by highlighting the sentences to provide a more meaningful context. These features can align with Principle 2 (authenticity) and Principle 4 (naturalness) as students are exposed to natural language use with the help of more interactive and relevant learning process. Moreover, Principle 8 (integration of other skills) and Principle 7 (personalized practice) have been addressed in the adapted activity since learners are involved in reading a text, answering the questions in a written way and discussing and presenting their points (integration of other skills) and provided with a worksheet to organize their ideas by promoting reflective learning (personalized practice). Furthermore, as students are asked to make model sentences on their own, it can give them a chance to apply their gained knowledge in a communicative manner to promote fluency and self-expression (Principle 9) while each pair receives constructive feedback from their peers to promote collaborative learning while practicing oral skills in this task (Principle 6). Therefore, the adapted version of the existing material can better cater for the specific needs of the participants in this project.

5 Acknowledgement

6 Conclusion

The adaptation and supplementation of English textbooks for national contexts present a complex and multifaceted process that requires careful consideration of various crucial aspects. From the incorporation of cultural elements and students' preferences to the influence of government policies and the overarching aims of learning English, there are numerous necessary factors that must be taken into account. Additionally, the selection of text topics and alignment with students' proficiency levels play a pivotal role in ensuring effective language acquisition.

This study has shed light on the challenges and opportunities inherent in adapting and supplementing English textbooks for national contexts. It has emphasized the importance of tailoring educational materials to suit the specific needs and nuances of diverse educational landscapes. By addressing these issues, educators can enhance the quality and relevance of English language education, ultimately benefiting students' language acquisition and overall learning experience.

Looking ahead, future directions in this field should focus on continued research and collaboration to further refine and improve the adaptation and supplementation process. Additionally, efforts should be made to incorporate innovative teaching methodologies and technology to enhance students' engagement and learning outcomes. By staying attuned to evolving educational trends and student needs, educators can ensure that English language education remains dynamic, effective, and tailored to the unique contexts in which it is taught.

In essence, the adaptation and supplementation of English textbooks for national contexts represent a vital aspect of language education that requires ongoing attention and innovation. By addressing the necessary aspects and embracing future directions, educators can continue to enhance the quality and effectiveness of English language teaching and learning on a global scale.

References

1. Brown, H. D. (2014). *Principles of language learning and teaching* (6th ed.). Pearson Education.
2. Chalipa, S. (2013). The effect of inductive vs. deductive instructional approach in grammar learning of ESL learners. *International researchers, 2*(2), 178-187.
3. Darvin, R., & Norton, B. (2015). Identity and a model of investment in applied linguistics. *Annual review of applied linguistics*, 35, 36-56.
4. Dörnyei, Z. (2014). *The psychology of the language learner: Individual differences in second language acquisition.* Routledge.
5. Ellis, R. (2005). Principles of instructed language learning. *System, 33*(2), 209-224.
6. Macalister, J. (2016). Adapting and adopting materials. In M. Azarnoosh, M. Zeraatpishe, A. Faravani, & H. R. Kargozari (Eds.), *Issues in materials development* (pp. 57–64). Brill.
7. McGrath, I. (2016). *Materials evaluation and design for language teaching.* Edinburgh University Press.
8. Moody, R. (1988). Personality preferences and foreign language learning. *The Modern Language Journal, 72*(4), 389-401.
9. Nation, I. S. P. & Macalister, J. (2010). *Language Curriculum Design.* New York & London: Routledge.
10. Savova, L. (2018). Local materials development practices. In J. I. Liontas (Ed.), *The TESOL encyclopedia of English language teaching* (pp. 1–13). John Wiley & Sons, Inc. https://doi.org/10.1002/9781118784235.eelt0720
11. Savignon, S. J. (1991). Communicative language teaching: State of the art. *TESOL Quarterly, 25*(2), 261-278.
12. Tomlinson, B. (Ed.). (2011). *Materials development in language teaching.* Cambridge University Press.

Possibilities of Organizing Personally Oriented Training When Teaching Natural Disciplines on the Secondary Specialized Educational Institutions

Nuriya Kylychova [1] iD orcid: 0009-0000-4944-7653
e-mail: nkylychova@mail.ru

Akylbu Zulushova [2] iD orcid: 0000-0002-6696-5265
e-mail: zikrillaev.n@gmail.com

Ainazik Akkozhoeva [3] iD orcid: 0009-0002-8549-2675
e-mail: Akkozhoeva@gmail.com

https://doi.org/10.5281/zenodo.14754568

[1]Department of physics and mechanical engineering, Osh Technological University, Osh, Kyrgyzstan
[2]Department of geography teaching and methodics, Osh State University, Osh, Kyrgyzstan
[3]Department of business management and social work, Osh Technological University, Osh, Kyrgyzstan

Abstract: The relevance of this study is characterized by the acute problem of quality education for students in secondary vocational institutions, which is required by the socio-economic development of modern society. The necessity, importance, and methods of teaching students of technical specialties using student-centered learning technologies are considered. The goal of personality-oriented training in the training of specialists by the requirements of the present time is to identify the abilities of each student, their development, training in independent access to scientific knowledge, updating and use of knowledge. Analyzing the organization of the educational process in secondary vocational educational institutions, as a result of the analysis it was found that students' personally oriented activities are treated without due attention. Therefore, this article analyses the requirements of modern education, which expresses the need to identify the abilities of each individual and their development. The results of the pedagogical experiment confirm that the use of personality-oriented learning in the teaching of natural disciplines in secondary vocational educational institutions has a positive effect on the formation of personal qualities and the improvement of scientific and cognitive activity.

Keywords: Personality, oriented learning, education, educational process, skills, method, cognition, activity, attention, feeling, perception, thinking, observation, analysis.

1 Introduction

Training is a pedagogical process aimed at acquiring certain knowledge, skills, and abilities by the student, intensifying educational and cognitive activity about the development of creative abilities, worldviews, and beliefs. The choice of the subjective cognitive abilities of each student when determining the content of training, what interests him most, and corresponding methods of mastering educational material contribute to the optimal organization of the educational process [1]. This means that it is necessary to study by exploring real learning opportunities, and specific characteristics, relying on individual psychology, and understanding the immediate growth zone of each student, without classifying students as capable and incapable. The main goal of this study is to demonstrate, through personality-oriented learning, that a person can develop high-level thinking skills and creative abilities aimed at activating such cognitive abilities. One of the main goals is to teach the student the skills of creative thinking, problem-solving, and making appropriate, productive decisions. Educators can achieve this goal only if they become more sensitive to and learn to stimulate their students' deep and complex thinking patterns. The idea about this belongs to the teacher I.B. Bekboev. He noted, "There should be an optimal combination of intellectual and emotional backgrounds of the lesson" [2].

The developmental function of teaching is aimed at the formation of sensory activity, observation, perception, and scientific ideas by managing educational activities. All this is achieved through cognitive activities such as observing, perceiving, remembering, and thinking, and is the basis of human orientation, like other psychological forms. At the same time, the problem of intensifying cognitive activity with any development of science and change in society can show its relevance in all cases. All this indicates the need to use a personality-oriented approach to learning in the educational process, which has recently caused heated discussions among teachers. We decided to analyze the values of this teaching method based on our teaching practice. Pedagogical practice shows that every new didactic tool used in teaching bears fruit in organizing the educational process. In this case, teaching tools and methods complement each other.

The purpose of this person-oriented training is to help each student develop their personal qualities, talents, abilities, and interests, and apply them in educational activities. The basic idea is that each person is unique and training should be tailored to their individual needs and abilities.

Personally-oriented learning implies the creation of conditions for the self-realization of the student's personality, and the development of his self-awareness, self-esteem, self-regulation, and purposefulness. It sets itself the task of not only transferring knowledge and skills but also helping the student become an independent thinker and an active subject of the educational process.

Thus, person-centered learning is an effective pedagogical approach that allows the teacher to take into account the individual characteristics of each student, help them realize their potential, and achieve success in school and life.

2 Technology for obtaining materials and research method

Modern education not only provides knowledge but also fulfills the task of shaping personality. Personally-centered learning is becoming increasingly popular in education, as it helps to take into account the individual characteristics of each student and develop his potential. The main task of the secondary vocational education system is to prepare competitive mid-level specialists in the development of production, and science and create conditions for their comprehensive development in the educational process. A modern graduate of a secondary vocational institution must be an active, creative, flexible specialist with a wide range of competencies, capable of independently obtaining comprehensively developed, updated knowledge, adapting to changes in science, increasing the level of their knowledge and skills, and adjusting and supplementing them. One of the possible ways to solve this problem is personality-oriented training for secondary educational institutions students in the process of teaching natural science subjects.

The main feature of technical education is the conduct of educational and laboratory research using special research tools. The use of active methods in the learning process, and its effective organization, as a result of which the activation of students' cognitive activity in learning plays a key role. In traditional education, knowledge is transferred only from the outside, from a teacher, from a textbook, etc. to didactic means [3]. Also, with such training, the goal of the lesson is not specified depending on the individual characteristics and abilities of the student, i.e., the low or high level of student performance is not taken into account, which is excluded in a differentiated approach to learning. It follows from this that traditional training includes only the transfer of the specified education. In a personality-oriented approach to teaching an innovative method that meets the requirements of the present time, education is the very foundation of a cognizing subject, i.e. knowledge is not transferred to him in finished form, it needs to be dug, deepened, and expanded through his activities. The teacher acts in the educational process not only as an information source of knowledge but also as a guide that promotes the growth of cognitive activity. The center of the learning process in education is not the teacher or the subject, but the subject receiving knowledge (human, learner, student, etc.). Therefore, every teacher should begin organizing a lesson by studying the personal qualities of students. After all, he can determine the level of preparedness and abilities of each student, using various methods in teaching.

Personally-oriented learning, taking into account the individual characteristics of the student, reflects the following various requirements for modern education:

- Individualization of training. Each student has unique abilities, needs, and pace of learning. Personally-oriented learning presupposes the presence of a flexible system of assessment and adaptation of the educational process to a specific student.

- Taking into account psychological characteristics. During the learning process, it is necessary to take into account the individual psychological characteristics of the student, such as motivation, interests, level of self-esteem, etc.

- Development of personal qualities. One of the goals of student-centered education is the development of the student's personal qualities, such as independence, responsibility, tolerance, creativity, etc.

- Support for individual growth. The educational system must create conditions for the development of the student as an individual, and help in self-realization, self-knowledge, and self-actualization.

- Creation of a favorable educational environment. For the successful implementation of student-centered learning, it is necessary to create a friendly, supportive, and inspiring educational environment that promotes the intellectual growth and personal development of the student [4].

Therefore, for the successful implementation of a student-oriented approach in teaching natural sciences, it is proposed to organize individual and group lessons, during which students can ask questions, express their ideas, and share their observations. This approach promotes the development of critical thinking, independence, and creative potential of students.

However, students often fail to meet these requirements due to a lack of motivation, inability to work in a team, or personality problems. To stimulate students' interest and help them better understand the material, it is important to use a variety of teaching methods, such as practical work, laboratory research, project assignments, and others. It is also important to take into account the individual characteristics of each student and provide sufficient support and assistance if necessary.

3 Experimental results and their discussion

Let us analyze the organization of the psychological stages of the cognitive process with the help of person-centered learning using the example of teaching the subject of physics. To consider student-centered teaching methods in physics lessons, you can use the following methods:

1)Individual approach. For successful work, it is necessary to take into account the individual characteristics of each student. An individual approach involves analyzing the characteristics of the student's personality and developing an individual training plan. For example, you can develop a program that includes interesting and practical tasks for students with low motivation. With an individual approach, the teacher divides students into groups depending on their participation in the lesson ("average", "good", "best") and offers educational material depending on its volume, complexity, and processing speed. In student-centered learning, the student's characteristics are determined by the following parameters: cognitive experience, what interests him most in terms of the content of the material being presented, the choice of ways to read and study the material, the type of response (on the board or the spot) and character (written or oral) to allow choosing, to attract the student's attention to how he thinks, remembers, thinks. The teacher, as an organizer, fulfills the task of dividing students according to their differences, creating conditions for maximum work by each of them;

2)Work in a group. Working in groups helps students develop communication skills, learn to work in teams, and solve problems together. When working with a group, the ability to express one's opinion, analyze a partner's

response, correct noticed errors, and conclude is formed. It is important for each student to have their role in the group and to have the opportunity to express their individuality;

3)Practice. Practical activities allow students to apply their acquired knowledge in practice, which helps them master the material and develop professional skills. In addition, hands-on activities help students develop self-confidence and a sense of personal growth;

4)Debate lesson. During the lesson, discussions can be held on current topics of interest to students. Debates and discussions can also be conducted to develop critical thinking and argumentation. The discussion should be beneficial, and have a positive impact on personal development [5].

Personally-oriented learning determines the abilities of each individual and reflects modern educational requirements, indicating the need for its development. Organizing classes with a personal orientation poses the following necessary tasks for teachers:

1) When teaching, work is carried out not only with the entire group but with each student, that is, attention is paid to the student's active participation in learning the material. High-quality assimilation of educational material is possible only if its content is correlated with the personality of the student. The student must "see" the material not as something abstract about him, but in a way that directly concerns and affects him, is connected with him, his life, and his professional future;

2) The transition from standard traditional teaching to active student participation in learning. Create conditions in the classroom that allow each student to show initiative, and independence in logical thinking, research, and active work;

3) Considering the individual characteristics of the student, the teacher plays the role of a coordinator, creating comfortable conditions for maximum work and development of the student, helping him to realize his potential and achieve his goals;

4) Achieving the highest level of cognitive activity is a high awareness of mental activity, through the activation of observation, attention, awareness, learning, and other forms of cognition.

To form cognitive activity and consolidate the studied material in the educational process when studying natural disciplines in secondary educational institutions, practical classes, and laboratory work are mainly conducted.

Personally-oriented learning in the natural sciences can be considered as a method that focuses on the importance of individual characteristics of students in the learning process. Psychological stages of the cognitive process, such as perception, attention, memory, thinking, etc., can be organized taking into account the personal characteristics of each student [6].

It is important to remember that each student is unique and has his strengths and weaknesses, so it is important to tailor the teaching material and methodology to best suit the individual student. For example, for students with a visual type of perception, it will be useful to use visualization of the material, while for students with an auditory type, it will be effective to conduct discussions.

When organizing the psychological stages of the cognitive process using student-centered learning, it is important to take into account the motivation of students, and their personal goals and interests. This will help create a positive atmosphere in the learning process and increase motivation to learn.

As you know, person-oriented learning is aimed at developing the student's personality, self-awareness, self-knowledge, and self-development. That is, the individual characteristics of each student must be considered in the educational process.

The organization of the psychological stages of the cognitive process within the framework of person-centered learning can be as follows:

1. Motivation. This stage involves working on the student's motivation, interests, needs, and goals. The teacher must help the student understand the importance of the educational material, find personal significance and motivation for studying it [7];

2. Perception and attention. At this stage, the teacher helps the student to comprehend the information, adequately perceive it, and pay attention to it. It is important to create suitable conditions for perception and pay attention to the individual characteristics of each person;

3. Understanding and comprehension. The teacher collaborates with the student to help him understand the meaning and meaning of the material being studied. It is important to help build connections between new information and his existing knowledge and experience [8];

4. Memorization and application. At this stage, the teacher helps the student consolidate the learned material and learn to apply it in practical situations. It is important to use a variety of teaching methods so that he can remember and apply new knowledge;

5. Assessment and self-reflection. After completing the training, the student must analyze his results, evaluate his progress and identify strengths and weaknesses. The teacher helps him conduct self-assessment and self-reflection for further self-improvement [9].

Thus, the organization of the psychological stages of the cognitive process with the help of personality-oriented learning in the natural sciences makes it possible to take into account the individual characteristics of each student, create comfortable conditions for learning and increase motivation for learning.

As our observations show, students use all senses differently at different levels to recognize the world around them, because the emotional and perceptual abilities of each person are individual, not all students have the same knowledge, skills and abilities. Research has shown that, under the same conditions, the human brain retains information as a result of 10% hearing, 50% vision and 90% of what it does itself, demonstrating in practice [10].

For example, when studying physics through the senses, they control the course of physical phenomena by perceiving the external world in the brain. The golden rule of didactics in pedagogy Ya. A. Komensky: "To learn, you need to use all the senses in unity" should always be the focus of every teacher's attention. At the same time, it corresponds to the principle of didactics in the learning process, which states: "The principle of durability is information which must be perceived and remembered.

In addition, according to Komensky, information should be presented in such a way that it is remembered for a long time. To do this, it is necessary to use various teaching methods, repeat material, and also create interesting and memorable situations that will help students retain information in memory.

Following from the above, a student-centered approach to learning shows that it should be presented by the acceptable abilities of each student, and the level of acceptance (from easy to difficult, from simple to complex, from known to unknown).

The most important problem in cognitive activity is the ability to think and observe. Through observation, an image of the represented physical phenomena is formed in the brain, which gradually helps to form physical laws.

Thinking is the highest form of the cognitive process. It is a process of reflecting the actual real world through cognition, generalization, and abstraction. As a result of thinking, in addition to feeling and perception, one can explore the general patterns of objects and phenomena, as well as their relationships and mutual relationships [11]. Experiments conducted during laboratory classes lead to the development of logical thinking, observing, and analyzing ongoing processes to remember the results of the experiment.

Thus, an important aspect for the teacher is the awareness of the personal activity and internal strengths of students when organizing cognitive psychological stages [12]. This helps them make informed choices, make decisions and be responsible for them, which contributes to the development of the educational and professional

orientation of the individual and increases the efficiency of the educational process. It is also important for a teacher to be able to respect everything within the framework of the topic being discussed.

These relationships change the atmosphere of the lesson, making the lesson free, enjoyable and active. The audience begins to lean towards a friendly form of communication, rather than mentoring and control. Each student realizes that he is given the right to choose his path of development based on his characteristics and aspirations for knowledge. All this accustoms him to active creativity, increased intellectual effort, and analysis of acquired knowledge.

4 Conclusion

The content of personality-oriented learning is aimed at justifying one's identity, determining one's worldview in life, choosing important values for oneself, acquiring a certain system of knowledge, finding an area of interest in scientific and life problems, and separately studying the methods of their solutions.

A person-oriented approach allows taking into account the individual characteristics of each student and contributes to the development of his potential.

The use of student-centered teaching methods, such as individual approach, group work, gaming technologies and practical exercises, significantly increases the effectiveness of teaching natural subjects in secondary educational institutions.

The main principle of student-centered learning is the development of personality as an active participant in the educational process and the individual characteristics of each student.

Results of the pedagogical experiment confirmed that the use of personally oriented teaching of physics for students of secondary vocational educational institutions has a positive effect on the formation and improvement of scientific and cognitive activity.

References

1.Babaev D.B., Khaitov Sh.K. Ideas of problem-based and developmental learning at lectures on physics at technical universities - WEB OF SCHOLAR - Warsaw, 2017. No. 8(17) - pp. 24-28

2.Zulushova A.T. The role of teacher's professional competence in the formation of natural scientific concepts in the process of teaching biology, Theoretical & Applied Science, 06 (86) ESISJ, 2019, 76-79pp.

3.Kurmankulov Sh. Zh., Beshkempirova V.K. Features of the competency-based element of teaching natural and mathematical disciplines. Pedagogy and modernity No. 1. 2016 Taganrog. pp. 60-63

4.I. B. Bekboev, Theoretical and practical issues of personalized learning technology: teaching-methodical guide (Bishkek: Uluu toolor, 2015)

5.Friedman LM. The concept of person-oriented education. Magazine "Zavuch". 2000. - No. 8. - S. 77-87.

6.Yakimanskaya I.S. Person-oriented education in a modern school. - M.: September, 1996. - 96 p.

7.A. B. Satybaldyev, N. E. Kylychova, M. K. Zhoroeva, features of personality-oriented learning for students studying in technical areas In the collection: Pedagogy, psychology, linguistics: socio-cultural paradigms. Materials of the IX All-Russian Scientific and Practical Conference. Ryazan, (2023)

8.J.C. Ryan, The contribution of cognitive psychology and organisational psychology to our understanding of scientific performance. In: Hurley, J. (eds) Scientific Research Effectiveness. Springer, Dordrecht. (2023)

9.Mambetakunov E.M. Fundamentals of pedagogy - Bishkek, 2008.-72 P.

10.Raimkulova, A.S. The organization of cognitive work is the leading competence of a future teacher Bishkek, 2010

11.Kylychova, N.E. The organization of independent work of students as the main factor of activation of scientific cognitive abilities– Science, new technologies and innovations of Kyrgyzstan-2022. - pp. 8-159-164.

12.Kylychova, N.E. formation of cognitive activity of students in the process of teaching physics in colleges Bulletin of the OSPU named after A. Myrsabekov No.1-1. (19) 2022. pp.112-115

Interactive and modular learning technology as an innovative component of modern pedagogical technologies

Abay Duisenbayev [1] orcid: 0000-0001-9144-2020
e-mail: adk7575@mail.ru

Gulmira Yermekbayeva [2] orcid: 0000-0001-5497-1062
e-mail: gabitovna86@mail.ru

Aigul Tokzhanova [3] orcid: 0009-0007-5031-8411
e-mail: aigul_tokzhan@mail.ru

Mira Baltymova [4] orcid: 0000-0002-2758-8436
e-mail: mbr76@mail.ru

https://doi.org/10.5281/zenodo.14761995

[1]Al-Farabi Kazakh National University, Almaty city, Al-Farabi str., 71, Kazakhstan
[2]Aktobe regional university named after K.Zhubanov, Aktobe city, A.Moldagulova ave., 34, Kazakhstan
[3]Aktobe regional university named after K.Zhubanov, Aktobe city, A.Moldagulova ave., 34, Kazakhstan
[4] Al-Farabi Kazakh National University, Almaty city, Al-Farabi str., 71, Kazakhstan

Annotation: This article examines the cognitive role and didactic significance of modular learning technology, aimed at the comprehensive development of a harmonious personality of students, taking into account their abilities and capabilities. Let's take a closer look at the advantages of using interactive-modular technology when teaching the Kazakh language in a national school. Effective training in the state (Kazakh) language) a language as a non-native language is possible if the following pedagogical conditions are taken into account in the process of creating an educational language environment: structuring of educational material aimed at facilitating the communicative process; ensuring the spatial behavior of students in dialogue and role forms; building the educational process on the basis of individual and differentiated approaches, taking into account the cognitive and personal characteristics of students. By the example of using various speech exercises and situational role-playing games, the methods of creating a language environment as a psychological factor of teaching a non-native language are revealed. Creating a favorable language environment allows you to solve the main problem when learning any language-overcoming the language barrier through immersion in the language. A special role in this case is played by the principle of interrelated training in the types of speech activity, aimed at the formation of communicative competence.

Keywords: pedagogical technology, personality-oriented approach, modular learning technology, cognitive activity.

1 Introduction

The term "pedagogical technology" has many interpretations and approaches. For example, V.P.Bespalko defines pedagogical technology as "... a set of means and methods of reproduction, theoretically based learning and education processes that allow you to successfully implement the set educational goals, content technology that organizes the effective educational process" [Bespalko V.P., 1995].

I.P.Volkov, as "...the process of achieving the intended learning outcomes" [Zaitsev, 2012].

V.M.Monakhov, as "...a detailed model of joint pedagogical activity with full provision of all necessary conditions for students and teachers" [Monakhov, 2006].

V.A.Slastenin, as "... pedagogical activity that has high efficiency and provides guaranteed results" [Slastenin, 2015].

E.S.Polat, as "... the introduction of new pedagogical technologies will change the very paradigm of education and only new information technologies will allow the most effective implementation of the opportunities inherent in new pedagogical technologies" [Polat, 2020].

V.S.Kukushin "... pedagogical technology functions both as a science that studies the most rational ways of teaching, and as a system of methods, principles and regulations used in teaching, and as a real learning process" [Kukushin, 2004].

From the above definitions of scientists, the following conclusions can be drawn:

- the educational process is a system that has interrelated and mutually dependent components;
- structural elements of technology – objectives and content of training, methods and means of training, results of activities;
- humanistic activity of the teacher and the student within the learning process;
- mandatory control over the process of cognitive activity of students.

Recently, various pedagogical teaching technologies have been created and introduced into school practice, including the methodology of developing learning (L.V.Zankov, D.B.Elkonin, V.V.Davydov, V.V.Repin, V.A.Levin); advanced learning (S.N.Lysenkova); assessment actions (S.A.Amonashvili, I.P.Volkov); learning based on reference notes (V.F.Shatalov); differentiated learning; integrated learning systems; developing learning through multi-level tasks; the technology of project-based learning, learning based on integrated units of Erdniev, problem-based learning, the method of active learning, etc. [Koshimbetova, 2004]. Scientists have developed such effective technologies as project, research, competence, activity, and many others. In Kazakhstan, teaching technologies are actively used by Zh.A.Karaev ("Three-dimensional methodological system of training"), A.A.Zhunisbek (technology of multi-level differentiation), M.M.Zhanpeisova (interactive technology of modular training), etc.

In this study, we will focus on two technologies – personality-oriented and modular.

Recently, among the numerous pedagogical technologies, a special place is occupied by a personality-oriented learning technology, which involves changes in the relationship between the teacher and students, in which the main role is assigned to students, based on a "student-centered" approach.

Personality-oriented technology affects the free and creative development of the individual, the realization of its potentials, thanks to the comfortable pedagogical conditions.

When developing a creative personality, the responsibility falls on the teacher, who, according to the scientist-teacher I. P. Podlasy, should be able to "educate and guide, listen and hear, have a broad outlook, a culture of speech, and inspire confidence in relationships with people" [Podlasy, 2018].

When teaching foreign students on the basis of interactive pedagogical technology, they were considered in the dissertation studies of A.V.Kovalev, S.E. Nazanov [Kovaleva, 2015].

The learning process is focused on the development of the cognitive abilities of the individual, characterized by the active activity of the subject, the use of various techniques at their discretion to achieve the desired result.

The school has always considered its most important task not only to teach, but also to develop the individual, emphasizing the need to take into account the individual abilities and qualities of the individual in teaching knowledge. Modern pedagogy is characterized by a personality-oriented approach to the learning process. The personality-oriented approach to learning is part of the humanistic trend in pedagogy, the basic principle of which states: "The student, not the teacher, should be at the center of learning, the activity of knowledge, not teaching."

The personality-oriented technology provides comfortable conditions for the development of the individual, the realization of its potentials and the versatile, free and creative development of the child.

This technology involves taking into account the individual characteristics of each student. J.Dewey believes that a truly educational experience is one in which a person has the opportunity to both gain knowledge and develop their abilities [John Dewey, 2000].

In other words, the educational process should be differentiated taking into account the natural inclinations, abilities and conditions of socialization in a modern school.

I.S.Yakimanskaya, based on the analysis of various psychological and pedagogical concepts of teaching, identifies and characterizes the three most common models: socio-pedagogical, subject-didactic, and proper-psychological [Yakimanskaya, 1979].

I.S.Yakimanskaya argues that in personality-oriented learning, an individual approach is the fundamental principle of the entire educational process, the purpose of which is the disclosure and development of each child. "With a personal approach, the existence of individual differences among children is a necessary condition for achieving the goal – to ensure the development of each student as a unique personality" [Yakimanskaya, 2006].

V.V.Serikov also believes that there is only one way to implement the personal approach in teaching – "to make learning a sphere of self-affirmation of the individual" [Serikov, 1999].

He notes that a person-affirming situation may contain at its core:
- "moral choice;
- independent goal setting and its achievement under the control of your own consciousness and will;
- implementation of the role of a co-author of the educational process;
- an obstacle that requires the exercise of will and the experience of the joy of one's own discovery;
- a sense of self-importance to other people;
- self-analysis and self-assessment of your achievements;
- awareness of their responsibility for the phenomena of natural and social reality, etc." [Serikov, 1999].

The essence of the concept of personality oriented education proposed by V.V.Serikov is represented by the following provisions:
- personality is a pedagogical category that reflects a specific sphere of education and human development.
- a person must master the experience of "being a person", i.e. the experience of performing the functions of a person (reflection, self-realization, education of social responsibility, etc.). "Thus, the social education of the person is carried out in educational institutions, which are composed of primary groups, that is, from the peer group as micro-factors socialization" [Duisenbayev and others, 2016].

The goal of personality-oriented education is to create conditions for the development of the sphere of personal functions of the individual.

The author identifies specific patterns of subject-oriented education:
- the design element becomes a life experience, in which knowledge is part of it.
- learning is a joint activity of a teacher and a student.
- the learning process is a source of personal experience.
- learning becomes closer to the natural life of a person.

The interaction of the teacher and the student acquires the features of interpersonal, intersubjective communication [Serikov, 1999].

The foundation of personality-oriented learning is a personal approach.

The personal approach in education and training is the attitude to the student as a person, as an individual.

The goal of subject-oriented learning is to enable each student to realize themselves in educational activities in accordance with their capabilities and abilities.

In a personality-oriented system, the main educational processes are: developmental training; pedagogical support for the formation of a child's personality; education as a concern for the spiritual and moral development of the child. The goal of personality-oriented education is to support and develop a person, to lay in him the mechanisms of self-realization, self-development, self-education. The characteristic features of such technologies are: cooperation, dialogue, activity-creative nature, focus on supporting the individual development of the child, providing him with all the conditions for development, for making independent decisions.

Personality-oriented technologies are aimed, first of all, at the child's personality itself, providing comfortable, humane and safe conditions for its development, the realization of all its potentials.

As practice shows, the technologies of modular training are currently promising, which are distinguished by enlarged blocks-modules, a consistent system, and completeness.

In the late 80s-early 90s, a new term from the field of technical sciences appeared in pedagogical science – "module". Since then, we have started talking about the advantages of modular training in the education system. The word "module" (from Lat. "moduilus" - measure) has many meanings in various sciences. From the point of view of pedagogical science, the module is an important part of the entire system, without the knowledge of which the didactic system does not work. According to its content, the module is a complete, logically complete block [Lavrentieva, 1998].

A training module is a logically completed form of a part of the content of an academic discipline, including cognitive and professional aspects, while mastering it should be completed with an appropriate form of knowledge, skills and abilities control.

The module contains cognitive and professional characteristics, in connection with which we can talk about the cognitive (information) and educational-professional (activity) parts of the module. The objectives are, first, to teach theoretical knowledge, and secondly, to develop skills and abilities based on the acquired knowledge.

The technology of modular learning as an alternative to traditional learning appeared and gained popularity in educational institutions in the United States and Western Europe in the early 60s of the twentieth century. In domestic didactics most complete basics of modular training have been studied and developed P.A.Yucevicene and T.I.Chumovoy.

P.A.Savicheva claims that the feature modular training that the trainee is able to work with an individual educational program, which includes the necessary action, information and guidance on how to achieve the result" [Yucevicene P.A., 1990].

The theory of modular learning is based on a system of principles related to general didactic ones. Its leading principles include the principles of modularity, dynamism, activity, and flexibility in structuring the content of training [Tretyakov, Sennovsky, 2001].

The principle of modularity assumes the integrity and completeness, completeness and consistency of the construction of units of educational material in the form of blocks-modules, the educational material is structured in the form of a system of educational elements. The principle of modularity has the following pedagogical rules:

- the training material is planned in the form of a module that ensures that students achieve their educational goals;
- training material in the form of a complete block;
- integration of different types and forms of training to achieve the intended goal;

The principle of structuring the content of training provides for integrity, a certain structure consisting of separate elements.

The principle of dynamism is determined by the following pedagogical rules:

- the content of each module can be changed and supplemented;
- based on the structuring of the elements of different modules, it is possible to create new modules;

When implementing the principle of the method of activity, the following pedagogical principles should be noted:

- objectives in modular training are formulated in terms of activity methods and modes of action;
- for the implementation of the goals, both disciplinary and interdisciplinary construction of the content of the modules is possible;
- problem-based approach to learning;

The principle of flexibility provides the possibility of the content of the training and the ways of its assimilation to the individual needs of the trainees.

When implementing this principle, the following conditions must be met:

- input diagnostics of knowledge for individualization of the training content;
- its results should make it possible to build an individualized structure of a particular module;
- a training needs analysis is required in order to individualize the training content;
- individual rate of assimilation;
- individual control and self-control.

The principle of conscious perspective requires an understanding and awareness of the perspectives of the teaching. And awareness of activity forms a positive motivation for learning and, consequently, develops cognitive interests.

When implementing the principle in the process of modular training, it is necessary to take into account the following pedagogical conditions:

- each student is presented with a modular program;
- a comprehensive didactic goal that the student must understand and realize;
- drawing up a program of training activities to achieve the goal;
- at the beginning of the module, specify the objectives of the exercise as the results of the activity;

The principle of versatility of methodological counseling ensures professionalism in the cognitive activity of the student and the pedagogical activity of the teacher.

With this principle, the following pedagogical conditions must be met:

- the training material is presented in modules using an explanation that facilitates the assimilation of the material;
- the modules offer various methods and ways of learning the content of the training, for free choice of your learning path;
- implementation of methodological advice by the teacher on the organization of the learning process;
- free choice of the teacher's teaching method and scheme.

The principle of parity requires subject-subject relations between the teacher and the student.

The pedagogical process will be effective if the student himself is as active as possible, and the teacher will perform an advisory and coordinating function.

The principle is provided by the following pedagogical rules:

- ensuring the possibility of independent learning of knowledge by students;

- the modular program creates conditions for the teacher to use the consulting and coordinating function;
- the modular program creates conditions for the teacher and the teacher to jointly choose the optimal learning path.

The teacher in the process of modular training must transform some of the management functions of the modular program into self-management functions [Yutsevichene P.A., 1990].

Thus, all of the above principles of modular learning are closely interrelated with the principles of personality-oriented technology, which contributes to the creative development of students.

Literature review.

The technology of modular training was improved in the works Maurice Gibbons (1971), Klingstedt (1971), Sam Duker (1972), Goldschmid & Goldschmid (1973), Carter V. Good (1975), L. M. Rosen (1976), Juan A. Morallo III (1980), Theodossin (1986), Van Eijl (1987), Sternberg (1988), de Wolf (1989), Amparo S. Lardizabal (1996), Greg Bowe (2006), John Vassiliou (2011) and others. It is the features of modular training in comparison with traditional technologies that continue to interest scientists engaged in research of promising pedagogical technologies [Lompscher, 1982].

The principles and functions of modular training are defined differently by domestic scientists (T.V.Vasilyeva, V.P.Lanchinskaya, L.M.Tverdina, M.Teresevichene, N.M. akovleva, etc.) and foreign scientists (B.Goldschmid and M. Goldschmid, D.Russell, G.Owens, S.Postlethwaite, etc.).

In our work, we will focus on the definition of the essence of modular learning, given by P. A.Yutsevichena. He defines modular training as a type in which students have the opportunity to work more independently according to the individual curriculum proposed by them [Yutsevichene, 1990].

The essence of this system is revealed through modularity, dynamism, flexibility, the use of the method of activity, the structuring of the content of training, the variety of forms of methodological advice, the effectiveness of the knowledge system, the subject-subject relationship.

A possible solution to the problem of teaching the Kazakh language, in our opinion, is to turn to the modular principle of teaching. As noted by P. A. Yutsevichene, the modular principle is identified with the formation of an independent planned unit of educational activity that helps the student to achieve their goals [Yutsevichene, 1990].

The content of the training in accordance with the goal is independent blocks. The didactic goal contains not only an indication of the scope of the task, but also the level of its assimilation. Modules allow you to transfer learning to a subject-subject basis, to individualize work with individual students, to change the forms of communication between the teacher and the student.

The teacher acts as an organizer of independent educational, communicative, and creative activities of students. He has more opportunities to differentiate the learning process, to organize interpersonal communication of students in the process of their interaction to improve their speech skills.

Various points of view are expressed on the problem of structuring the content of training. Thus, M.A.Choshanov under the block-module understands a logically completed unit of educational material, built on the principles of content "compactness, problemativeness, variability, sign-graphic clarity" [Choshanov, 1996].

P.I.Tretyakov in modular technology highlights the advanced study of theoretical material in enlarged blocks-modules, algorithmization of educational activities, consistency of cycles of knowledge and other cycles of activity. The scientist emphasizes the awareness of goal-setting and self-goal-setting of educational activities in the modular technology, which puts the teacher in the mode of counseling and management within the framework of subject-subject relations. The consolidation of blocks of theoretical material, according to P. I.Tretyakova, saves a lot of time, which implies "a movement of disciple under the "General – General – a single" the gradual immersion in the details..." [Tretyakov, Sennovskaya, 2001].

V.P.Lapchinskii in the structure of modular training focuses on the design of educational material, contributing to the achievement of didactic problems, completeness of the material in the module, the integration of types and forms of education [Lapchinskii, 2006].

Yu.K.Balashov and V.A.Ryzhov noted the division of the block into completed parts (modules and its elements) that have independent significance, the screening of material that is "superfluous" for this particular type of work, the maximum individualization of progress in training [Balashov, Ryzhov, 1987].

2 Methodology

The core of modular training is a training module with an information block, a target program of actions of the student, and recommendations of the teacher for its successful implementation.

This training system is expressed as follows:

- the content of training as completed independent blocks, the assimilation of which is carried out in accordance with the set goal;

- the form of communication between the teacher and the students is carried out through modules that contribute to the implementation of the process of individual communication between the managed and the manager;

- the student works the maximum time independently, learns goal-setting, self-planning, self-organization and self-control.

The structure of the modular technology.

Interactive-modular technology consists of three parts: introductory, dialogical and final.

According to L. M. Friedman, the study of any section consists of three stages: introductory-motivational, operational-cognitive and reflexive-evaluative.

The introductory part of the training module reveals the main educational task of the upcoming work (the introductory and motivational stage).

The dialogic part of the training module contributes to the implementation of a holistic study of the section (topic) – operational and cognitive.

The final part of the training module is the final cycle of a section or topic (reflexive evaluation stage).

Table 1

Preparation of the dialogical part by the teacher

1. Selection of the main educational material of the dialogic part of the module
2. The training material is prepared holistically, compactly
3. Preparation of three-level tasks
4. Preparation of creative material
5. Ensuring dialogical communication in each lesson

The principles of the dialogic part:

- a holistic approach to the educational material.
- the principle of studying to increase the volume of the material.
- the principle of "returning" to the topic of the training module at each lesson of the dialogic part in order to strengthen the assimilation of the material.

The second feature of structuring the training module is the teacher training system.

Preliminary work of the teacher:

- determine the level of knowledge, skills and abilities at the moment, the goals and objectives of training;
- study of the training material for this module;
- identification and definition of key concepts that carry the main semantic load on this topic;
- drawing up reference diagrams on the topic;
- preparation of test tasks of the training module (within 15-20 tasks);
- preparation of a block of questions and tasks on the content of the training material of the module;
- development of the dialogic part, selection of active forms of learning.

Special attention should be paid to the technology of organizing work in groups.

A very important principle of modular learning technology is the principle of student activity, implemented through the use of game technologies. Professor R.G. Davletbaeva argues that the importance of learning games lies in the process itself. Holding games contributes to psychological relaxation, creating favorable conditions for communication, solving a whole complex of educational tasks [Davletbaeva, 2008].

Recall that the structure of the module consists of three training parts. Students ' interest and activity in the dialogic part of the module is especially increased. Games are a means of activating the educational process, encouraging interest in the material being studied, creating conditions for communication in the language being studied.

Communication is an important factor not only in the development of speech, but also in the development of personality. "Communication is genetically one of the earliest forms of child activity. It is in him that the peculiarities of the social being of man manifest themselves. It contains many different shades of attitudes towards people: parents, teachers, acquaintances, strangers, peers, juniors, friends. The child selects friends, he looks for communication with a certain circle of people, he influences others. In the team, he acts as an organizer, then as a performer. The activity of communication contributes to the formation of such important aspects of the personality as humanity, responsiveness, care, a sense of responsibility for oneself, one's actions in front of people" [Beisenbayeva, Ivanova, 2015].

The final part of the training module is the final part. In this part of the module, the assessment of the level of knowledge, skills and abilities formed in the process of cognitive activity of students is carried out [Davletbaeva, 2008].

3. Results

The experimental period of the study was devoted to testing the proposed pedagogical conditions for the formation of the educational language environment in the Kazakh language lessons in schools with Russian as the language of instruction.

Experimental work can be divided into two stages:

The first stage was devoted to the analysis of the state of school practice in teaching the Kazakh language in the Russian-speaking audience.

The aim of the study at the first stage (the stage of the ascertaining experiment) was to study the teaching of the Kazakh language in schools with Russian as the language of instruction.

The second stage was the organization of the educational process based on the modeling of the Kazakh language environment in the classroom and the generalization of the results of the study.

The basis of the research on the collection of primary information was schools №17, №27 in Aktobe city in Kazakhstan.

During the ascertaining cross-section, the following tasks were solved:

1. Study of programs, curricula, study of the state of preparation of teachers for the implementation of teaching the Kazakh language;

2. Identification of difficulties faced by students of Russian schools when learning the Kazakh language;

3. Establishment of the actual level of knowledge, skills, skills in the Kazakh language.

The results of the first stage of the study were obtained in the process of analyzing the curricula and programs in the Kazakh language, conversations with teachers of the Kazakh language, establishing the actual level of knowledge, skills and abilities of students in the Kazakh language.

We have studied the content of various curricula and programs of secondary schools. The analysis of these materials allowed us to identify the most characteristic features:

- curricula were developed taking into account the goals and objectives of a particular secondary educational institution;
- when drawing up the curriculum, schools were guided by the basic curriculum that meets the requirements of the State Standard of Education, and the variants of the curricula of general educational institutions;
- the curriculum reflects the weekly academic load, electives and circle classes.

As a result of visiting more than 60 lessons, we found that students in the Kazakh language lessons rarely ask the teacher questions of a cognitive nature; for the most part, the teacher himself is active in the lesson, which ultimately leads to a loss of interest in learning.

The results of observations, analysis of the Kazakh language, conversations with teachers in the pre-experimental period showed that personal development, individual psychological characteristics are not taken into account.

The vast majority of respondents noted the traditional nature of classes in the Kazakh language, which is mainly reduced to memorizing words, grammatical rules, reading and translating texts in the classroom.

However, students recognize that every educated person should know the state language, that learning it enriches knowledge about the life, culture and customs of their country, broadens their horizons, develops memory and thinking, that mastering the language will expand future job prospects.

In general, the study showed that the real level of teaching the Kazakh language requires a restructuring of the forms and methods of activity of both the teacher and the student.

The purpose of the study at the second stage was to create experimental pedagogical conditions that contribute to the formation of the educational language environment in the Kazakh language lessons on the basis of the organization of intensive speech activity.

A total of 167 students participated in the experiment. The control classes, which are taught according to the traditional method, were determined in the same schools. The analysis of students ' progress in the Kazakh

language and conversations with teachers who taught in the selected classes allowed us to conclude that the experimental and control classes had approximately the same level of training at the beginning of training.

In the course of the experiment, we were guided by the criteria we developed for the quality of students ' knowledge of the Kazakh language. The functions of the language environment served as the basis for the formation of the criterion of the quality of knowledge of students in grades 6-9. On the basis of the criteria developed by us in the process of teaching the state language, the levels of knowledge, skills and abilities in the conditions of the educational language environment were determined.

Based on the proposed criteria for the formation of knowledge of the state language in the educational language environment, we have identified three levels of its formation.

The high level is characterized by the presence of students ' increased interest in the study of the state language, conscious stable cognitive orientation, high knowledge, meaningful consistent assimilation of the material, high proficiency in the methods of learning language information and communication skills that provide an accelerated approach to the study of the state language and adequate formation of active, initiative, independent and creative activities.

At the middle level, there is a manifestation of a stable interest in the subject, a positive attitude to learning, good knowledge in accordance with the required volume, operating with communicative information with the transfer of learning skills from the specific to the generalized in the process of correcting knowledge with insufficient speech activity.

At a low level, there is a lack of interest in learning the state language, the presence of weak knowledge among schoolchildren. Students do not know the ways of active cognitive activity in the process of learning a language. Usually such students take an emotionally responsive position, but do not seek to express their attitude.

The results of the ascertaining cross-section showed an average level of knowledge in the Kazakh language. Thus, the results in both the experimental and control classes were approximately the same and showed the following: low - level students in the experimental class were 62%, in the control class - 64%; middle - level students in the experimental class - 24%), in the control class - 23%; high-level students in the experimental class-14%), in the control class-13%).

At the beginning of the experiment, a conversation was held with the experimental teachers about the goals of the experiment, the specifics of modeling the educational language environment in the Kazakh language lessons, about the features and principles of building and using educational materials.

Teachers were given recommendations on the organization and conduct of Kazakh language lessons.

Classes in the experimental and control groups were conducted by the same teachers, which ensured the unity of the requirements for the participants of the experiment, allowing purposefully and effectively manage the educational process.

At certain stages, other teachers were also involved in the experiment, which ensured the objectivity of the assessment of students ' knowledge, skills and abilities.

Control over the course of the training experiment was carried out by visiting and analyzing the lessons in the experimental classes, conversations with teachers and individual students, as well as during the lessons conducted by the author of the experiment.

4. Discussion

If at the initial stage of the experiment in the experimental class only 14%) of students (in the control class - 13%) had a high level of knowledge in the Kazakh language, then during the training experiment, according to the results of academic performance, according to the results of the intermediate section, which was offered to students of the experimental and control classes, their percentage was in the experimental-28% of students (in the control class-15%); the average level in the experimental class - 24%) (in the control class - 23%); their percentage was in the experimental class - 30%) (in the control class - 23%).%); low level in the experimental class - 64% (in the control-62%), their percentage was in the experimental class - 42% o (in the control-62%).

The results of testing the specified accelerator material in the 7th experimental class contributed to:

- formation of elementary speech skills;
- formation of a stable vocabulary;
- formation of independent learning skills.

The work had a positive impact on the formation of students ' motives for a responsible attitude to learning and awareness of the need to learn.

After analyzing the results of the cross-section, we came to the conclusion that the formation of the educational language environment at the proper level requires a systematic presentation of not only grammatical (theoretical), but also lexical material that activates speech activity.

One of the ways to increase the productivity of language acquisition can be a comprehensive approach to teaching the lexical and grammatical aspects of speaking. A comprehensive approach to the lexical and grammatical aspects of speaking the Kazakh language is understood as such training, which is aimed at the simultaneous formation of lexical and grammatical skills on the basis of a special set of techniques that take into account lexical and grammatical connections at different levels. The lexico-grammatical relationship should be manifested in the fact that the vocabulary is not assimilated in isolation, but fits into the ultimate grammatical context. This connection leads, in our opinion, to a gradual, consistent formation of speech skills.

At the next stage of our experiment, we developed textbooks and methodological manuals (7, 8, 11 cl.) on the Kazakh language for grades 7, 8, 11, compiled on the basis of the following principles:

- accessibility and consideration of psychophysiological, age-related features of the student's personality development;
- the need to repeatedly return to the material under study;
- unity of lexical and grammatical topics;
- use of sign models for mastering the grammar of the Kazakh language.

In the experimental educational and methodological manuals, the lexical material, as well as the grammatical material, was combined into blocks (according to the principle of enlarged presentation of the material).

Thus, during the school year, students mastered the necessary lexical minimum provided by the program in a complex, as part of a kind of macro-themes (for example, "Winter", "My School", etc.).

So, all the grammatical and lexical material studied during the school year was presented in several modules.

A well-thought-out system of presenting theoretical and lexical material served as the basis for increasing the time for the development of students ' speech.

The study revealed a significant increase in the level of understanding of oral speech in the Kazakh language in the educational language environment. The task of a research teacher is to teach students to work independently, complementing the learning process with interaction with the language environment.

Active speech activity of the student at the lessons of the Kazakh language in the conditions of the language environment contributed to an effective increase in the overall level of his speech competence, the formation of a variety of indicators of the degree of language proficiency.

The analysis of the responses received as a result of the survey of students and interviews with teachers showed the following positive changes:

- the attitude of children to the study of the Kazakh language has changed qualitatively;
- steady pace of mastering the material was established;
- many students have become more serious about their learning activities.

Thus, the use of accelerated learning material that contributes to the creation of a learning language environment (broken down into modules, reference schemes, lexical macro-themes), according to teachers, has the following advantages:

- compactness, multiple returns to the topic (study of one topic for 5-7 hours) with the output of the result;
- the use of active methods and collective forms of learning, which allowed to develop the speech activity of students;
- the optimal combination in each module (block) of all types of speech activity (speaking, listening, reading, writing);
- formation of students ' positive motivation to learn the Kazakh language, genuine interest in it.

Conducting questionnaires and interviews with students revealed that the vast majority of students expressed a desire to continue working on this system.

Students were asked to answer the following questions:

1. Do you like to learn Kazakh using this technology?

2. Would you like to continue learning the language using this system?

When answering the first question, 97% of the students expressed a positive attitude. They noted that they have become more serious about learning the Kazakh language. The same percentage of students express a desire to continue studying under this system.

Here are some excerpts from the questionnaires:

«...The rules are given so that each student understands... "(Larisa K.);

"...The entire book is divided into modules. It quickly memorizes the training material" (Igor K.);

"...A lot of interesting and informative things. How can you not learn from this book?! This is a bridge to the world of the Kazakh language! " (Natasha T.);

".. .We stopped jumping like hares on different topics..." (Inna A.).

So, the study showed the need to provide students with accelerated educational material that facilitates and accelerates language acquisition and is aimed at forming speech activity, the foundation of the language environment.

It seems to us that the reliance on accelerated educational material, being one of the pedagogical conditions for the formation of the educational language environment, contributes to the implementation of such functions of language activity as accelerated - informative and a number of others.

5. Conclusion

At the final stage of the experimental work, control (final) sections were carried out, which allow us to trace the dynamics of changes in the level of knowledge of students in the educational language environment. The chart materials for the control classes show only minimal changes in the students ' knowledge levels. Thus, the analysis of the results allows us to conclude that the implementation of level differentiation allows us to improve academic performance, meet the requirements of the state standard, and create conditions for the formation of a language environment.

The final part of the training module is the control part. If during all the lessons of the dialogic part the work was carried out on the basis of mutual assistance, mutual learning, then in the final part the student must show knowledge, skills and abilities without outside help.

In the final part, all students are given tasks that meet the requirements of the state standard of education.

For the objectivity of the assessment of knowledge and the ability to increase the final mark in the final part of the training module, we conducted two types of control.

The first, mandatory type of control is testing. Several test options were offered:
- tests with add-ons;
- test reminders;
- test with an alternative answer;
- sample test;
- compliance test;
- combined test.

The second type of control-at the teacher's choice - is one of the following types of control works: test, relay test, control work, dictation, essay, presentation.

A differentiated approach in the educational process means effective attention to each student, his creative personality in the conditions of a class-based system of training according to mandatory curricula, involves a reasonable combination of frontal, group and individual classes to improve the quality of training and development of each student.

Thus, the effectiveness of the learning process based on the differentiated approach as a pedagogical condition for the formation of the educational language environment was confirmed experimentally.

References

1. Duisenbayev A., Baltymova M., Akzholova A., Bazargaliyev G., Zhumagaziyev A. Study of Problems of Individual's Social Education // International journal of environmental & science education. 2016, VOL. 11, NO. 15, P. 7899-7905. – P.7904.
2. Balashov Yu.K., Ryzhov V.A. Professional training of personnel in the conditions of capitalism. – M.:"Higher School", 1987. – 176 p. (in Russian)
3. Beisenbayeva A. A., Ivanova N. D. Pedagogy. A course of lectures. – Almaty, 2015. – 299 p. (in Russian)
4. Bespalko V.P. Pedagogy and progressive learning technologies. – Moscow: "Pedagogika", 1995. – 132 p. (in Russian)
5. Davletbaeva R.G. Formation of a modern bilingual personality in the process of teaching the Russian language in Bashkir preschool and school institutions. - Ufa: RIO "BSPU", 2008. – 128 p. (in Russian)
6. Dewey John. Democracy and education: translated from english. – M.: "Pedagogika-press", 2000. – 384 p. (in Russian)
7. Zaitsev V.S. Modern pedagogical technologies: a textbook. - In 2 books. - Book 2. – Chelyabinsk: "CHSPU", 2012. – 496 p. (in Russian)
8. Kovaleva A.V. Interactive pedagogical technologies in teaching foreign students the vocabulary of the Russian language: dissertation of the Candidate of Pedagogical Sciences: 13.00.02 / Kovaleva A.V. – Moscow, 2015 – 265 p. (in Russian)
9. Kushimbetova S.A. Pedagogical conditions for the use of innovative teaching methods in the educational proces / Ped. science. Kand. abstract. – Almaty, 2004. – 32 p. (in Kazakh)

10. Kukushin V.S. Modern pedagogical technologies. – Rostov-on-Don: "Phoenix", 2004. – 379 p. (in Russian)
11. Lavrentieva N.B. Pedagogical bases of development of modular technology of training. – Barnaul: Publishing house "AltSTU", 1998. – 252 p. (in Russian)
12. Lapchinskaya V.P. Secondary educational school of modern England. – Moscow, 1977. – 216 p. (in Russian)
13. Monakhov V.M. Introduction to the theory of pedagogical technologies. Monograph. – Volgograd: "Change", 2006. – 318 p. (in Russian)
14. Podlasyy I.P. Pedagogika: 100 questions-100 answers: ucheb. handbook for university students. – Moscow: "VLADOS-PRESS" Publishing House, 2018. – 365 p. (in Russian)
15. Polat E.S. et al. New pedagogical and information technologies in the education system: studies.manual for students. higher. studies. E.S.Polat, M.Yu.Bukharkina, M.V.Moiseeva, A.E.Petrov; ed. E.S.Polat. - 3rd ed., ispr. and add. – M.: Publishing Center "Academy", 2020. – 272 p. (in Russian)
16. Serikov V.V. Education and personality. Theory and practice of designing pedagogical systems. – M.: Publishing Corporation "Logos", 1999. – 272 p. (in Russian)
17. Slastenin V.A. et al. Pedagogy: A textbook for students. V.A.Slastenin, I.F. Isaev, E.N.Shiyanov; Ed. by V.A.Slastenin. – M.: Publishing Center "Academy", 2015. – 576 p. (in Russian)
18. Tretyakov P.I., Sennovsky I.B. Technology of modular education in school: A practice-oriented monograph / Edited by P.I.Tretyakov. – M.:"New School", 2001. – 352 p. (in Russian)
19. Choshanov M.A. Flexible technology of problem-modular training: amethodological guide. – M.: "National education", 1996. – 157 p. (in Russian)
20. Yutsevichene P. A. Theoretical foundations of modular education: dissertation of the Doctor of Pedagogical Sciences. – Vilnius, 1990. – 271 p. (in Russian)
21. Yakimanskaya I.S. Personality-oriented learning in a modern school. – Moscow, 2006. – 196 p. (in Russian)
22. Yakimanskaya I. S. Razvitie obuchenie. – M.: "Pedagogika", 1979 – 144 p. (in Russian)
23. Lompscher J. and Markova A., Ausbildung der Lerntit bei Shulern. – Berlin: Volk & Wissen. – 1982. – 28-35 p.

Evaluation of Influence of Solar Radiation Intensity and Wind Speed on Efficiency of Solar Water Heating Collector

Satybaldyev Abdimitalip [1] ID orcid: 0009-0006-2226-069X
e-mail: A.Baatyrbekovich@gmail.com

Tursunbayev Janbolot [2] ID orcid: 0009-0006-8465-7879
e-mail: jhanbolot.72@gmail.com

Mavlyanova Janara [3] ID orcid: 0009-0003-7513-1064
e-mail: janaramavlianova@gmail.com

Attokurov Anarbek [4] ID orcid: 0009-0009-0012-2271

[1,2,3,4]Osh Technological University named by M.M. Adyshev, Osh, Kyrgyzstan

Abstract: The purpose of this scientific article is to analyze and evaluate the influence of two key climatic parameters - the intensity of solar radiation and wind speed on the efficiency of solar water heating collectors. In recent decades, scientific interest in renewable energy has grown markedly, driven by global challenges such as climate change and rising fuel and electricity costs. This study provides an analysis of the operation of solar collectors located in the city of Osh with a continental climate. The authors use the mathematical tools to assess the effect of changes in sunlight intensity and wind flow rate on the thermal efficiency of these installations. The results presented in the article emphasize that an increase in the level of solar radiation leads to a proportional increase in the work of the collector. However, the influence of wind speed turned out to be more multifaceted: if at low speeds, an increase in the efficiency of the system was observed, then at higher speeds this led to an increase in heat losses. The article contributes to the development of the theory and practice of using solar energy, offering recommendations for optimizing the operation of solar collectors in various climatic conditions. The presented analysis is of great practical importance, laying the foundation for the further development and improvement of solar energy systems. This is relevant for achieving sustainable development goals and ensuring energy security.

Keywords: Solar radiation, performance of solar collectors, wind speed, thermal efficiency, energy efficiency, renewable energy sources, climatic impact, thermal losses, contact heat exchange.

1 Introduction

In recent decades, scientific and engineering interest in renewable energy sources has increased significantly due to global challenges such as climate change, sustainable development and energy security [1-3]. Solar collectors, in particular, are one of the most developing areas in the field of solar energy due to their ability to convert solar radiation into heat [4,5]. The efficiency of solar collectors can vary significantly depending on many factors, among which special attention is paid to the intensity of solar radiation and wind speed [6-8].

In previously published studies [6-8,9] of this area, the effect of solar radiation intensity on the productivity of solar collectors was most often considered, showing an increase in the thermal efficiency of devices with a proportional increase in radiation intensity. The effect of atmospheric conditions such as air quality and

temperature on reservoir efficiency was also studied. However, the question of the effect of wind speed on the performance of solar collectors is not sufficiently disclosed. Wind can have both positive and negative effects on the operation of collectors: on the one hand, it contributes to the cooling of the collector surface, reducing thermal losses, on the other hand, it can lead to a decrease in the effective area of irradiation due to vibrations and changes in the angle of incidence of sunlight [7,8].

The purpose of this study is to evaluate the effect of solar radiation intensity and wind speed on the performance of the solar collector. Through a comprehensive analysis of meteorological data and the results of solar collectors, this study seeks to identify the optimal conditions for their operation and suggest methods to improve their efficiency.

The terminology that will be used in this work includes the following definitions: "solar collector" (a device for absorbing solar radiation and converting it into heat), "solar radiation intensity" (the power of solar radiation incident on a unit of area), "wind speed" (the speed of the air flow at a certain height from the surface of the earth). The study is carried out using data collected from meteorological stations, as well as the results of ex-perimental tests of solar collectors.

This introduction logically leads to the hypothesis that optimization of the operation of solar collectors is possible due to the adaptation of their structure and operating modes to changes in the intensity of solar change and wind speed, which will increase their efficiency in different climatic conditions.

2 Materials and methods

Description of study site

Location: Osh town, located in the Kyrgyz Republic, occupies the unique geographical position in the Ak-Buura river valley at an altitude of about 1000 meters above sea level. Surrounded by mountains, Osh has a specific microclimate, which significantly affects its weather conditions, including the intensity of solar radiation and wind speed [10-13].

Temperature conditions

The climate of Osh is characterized as continental with hot summers, when temperatures can reach + 40 ° C, and relatively mild winters, with temperatures rarely dropping below -10 ° C. These conditions provide an optimal environment for the use of solar technologies, as high temperatures contribute to the effective heating of water.

Solar radiation

Osh is marked by a high level of solar activity, reaching up to 3000 solar hours per year, with an average annual radiation intensity of about 2000 kWh/m ². This creates ideal conditions for the research and recovery of solar water heating systems, especially in summer months, when there is a peak in solar activity and demand for hot water.

Wind conditions

Wind speed in Osh varies, but usually remains at a moderate level of about 3-4 m/s. However, in spring and autumn, However, in spring and autumn, winds can increase, reaching 7-8 m/s which can help cool the water in the collectors during periods of decreasing night temperatures.

Soil conditions

The region is characterized mainly by loamy soils, which do not significantly affect the functioning of solar collectors, but are important for the installation of support structures.

Due to its unique climatic conditions, the city of Osh is an ideal place for the deployment and study of solar water heating systems. The stable intensity of solar radiation and predictable wind speeds make it possible to achieve optimal conditions for the efficient use of solar energy.

Used materials:

1. *Solar collectors:* Flat panel models with high solar absorption and minimal thermal losses.

- Absorption surface: special coating with high absorption co-efficiency and low reflectivity.
- Thermal insulating materials: glass wool and aerogel for minimizing heat losses.

2. *Weather station:* An installation for recording the intensity of solar radiation and wind speed with an accuracy of 0.1 m/s for wind and up to 1 W/m² for solar radiation.

Assumptions and their justification

1. Solar radiation stability: It is assumed that the average monthly intensity of solar radiation does not change by more than 5% of the annual average, based on historical data for the region.

2. Effect of wind: Wind speed can have a cooling eff-effect on the collector, which reduces its thermal efficiency. This assumption is based on preliminary theoretical calculations and literary data.

Mathematical procedures

Mathematical modeling: Using differential heat transfer equations to model reservoir processes. Calculations are performed using numerical analysis software such as Python with the NumPy library.

During the development and improvement of solar water heating collectors (WHC) designed to provide hot water supply, key difficulties were identified. They include the disadvantages of the operating characteristics of current solar installations due to the complexity of their designs, the lack of optimization of production processes and high costs for materials, which leads to an increase in the cost of producing thermal energy [14]. Improving the efficiency of the WHC is a key aspect for the economy, since the productivity of the reservoirs is due to various factors, including their efficiency and thermal losses within the system.

The solar water heating collector shown in the picture 1 includes complex heat exchange components: 1- metal plates that receive heat; 2- metal heat removal plate for heat transfer to the water circuit; 3- pipelines for water circulation; 4- protective glass coating; 5- housing made of wood; a 6- insulation layer made of aerogel; 7- collector base made of plywood.
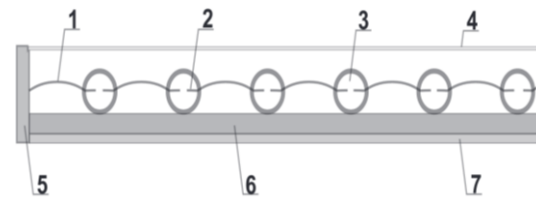
Picture 1. Solar water heating collector

The solar water-heating collector functions based on the principle of the greenhouse effect, when the sun's rays penetrate through the glass coating and heat the metal plates. They are placed between and inside water pipes through which water is circulated. This design provides high heat transfer to water due to uniform heat distribution through heat conduction from all sides.

There are two main approaches to evaluating the performance of solar water heaters. The first involves conducting long-term field experiments that make it possible to assess the operation of reservoirs in environmental conditions. The second approach is based on mathematic modeling of the heat exchange processes occurring in the collector in order to determine its efficiency depending on parameters such as solar radiation intensity and wind speed, etc. [6-8,15,16].

The method of calculating the operation of the solar water-heating collector is based on the balance of heat balance. In accordance with this principle, the amount of thermal energy absorbed by the solar collector should be equivalent to the combined amount of thermal energy accumulated inside the collector and heat losses discharged into the environment. The basic equation of the thermal balance of the solar water-heating collector establishes that the energy captured by the collector from the sun is equal to the sum of the energy stored by the collector and the energy of the system losses [17-21].

The thermal balance equation of the solar water heating collector can be written as follows:

$Q_{in} = Q_{out} + Q_{loss}$ (1)

where: Q_{in} - incoming heat, W; Q_{out} - useful heat, W; Q_{loss} - heat loss, W.

Incoming heat (Q_{in}) consists of two components:

• *Direct solar radiation* (Q_{sun}), W:

$$Q_{sun} = G_{sun} \cdot A_{col} \cdot \eta_{opt} \quad (2)$$

where: G_{sun} - solar radiation flux density, W/m²; A_{col} - the collector area, m²; η_{opt} - optical efficiency factor of the collector.

• *Scattered solar radiation* (Q_{diff}), W:

$$Q_{diff} = G_{diff} \cdot A_{col} \cdot \left(1 - \eta_{opt}\right) \quad (3)$$

where: G_{diff} - scattered solar radiation flux density, W/m².

The useful heat (Q_{out}) is the heat that is absorbed by the water in the collector.

$$Q_{out} = m_{water} \cdot c_{water} \cdot \Delta T \quad (4)$$

where: m_{water} - water weight, kg; c_{water} - is the specific heat capacity of water, J/(kg • ° C); ΔT - temperature difference between water and environment, ° C.

Heat loss (Q_{loss}) is heat that is lost by the collector to the surrounding medium.

$$Q_{loss} = A_{col} \cdot U_{loss} \cdot (T_{col} - T_{amb}) \quad (5)$$

where: U_{loss} - heat loss coefficient of the collector, W/(m² • ° C); T_{col} - collector temperature, ° C; T_{amb} - is the ambient temperature, ° C.

The heat loss coefficient (U_{loss}) can be calculated using the following formula:

$$U_{loss} = U_t + U_b + U_W + U_e \quad (6)$$

where: U_t - heat losses through the upper part of the collector, W/(m² • ° C); U_b - heat loss through the lower part of the collector, W/(m² • ° C); U_W - heat loss through the sides of the collector, W/(m² • ° C); U_e - heat losses due to wind, W/(m² • ° C).

Heat losses due to wind (U_e) can be calculated from the following formula:

$$U_e = h_{wind} \cdot (T_{col} - T_{amb}) \quad (7)$$

where: h_{wind} - convective heat exchange coefficient, W/(m² • ° C); T_{col} - collector temperature, ° C; T_{amb} - ambient temperature, ° C.

The convective heat exchange coefficient (h_{wind}) can be calculated by the following formula:

$$h_{wind} = 2 \cdot Nu \cdot k_{air} \cdot \left(\frac{L}{D}\right)^{0,5} \quad (8)$$

where: Nu is the Nusselt number; k_{air} - air thermal conductivity, W/(m • ° C); L - collector length, m; D - collector width, m.

The Nusselt number (Nu) depends on the wind speed (ϑ_{wind}) and the geometry of the collector:

$$Nu = C \cdot Re^n \cdot Pr^m \quad (9)$$

where: Re - Reynolds number, which depends on wind speed and characteristic length of the collector; Pr- Prandtl number, which is a characteristic of the working environment and is usually considered constant for this case; C, n, m-empirical coefficients derived from experimental data or theoretical considerations.

The Reynolds number is generally defined as:

$$Re = \frac{\vartheta_{wind} \cdot L}{\nu} \quad (10)$$

where: ν - kinematic viscosity of the working medium (air).

By substituting all these equations into the heat balance equation, an equation can be obtained to calculate the efficiency КПД (η) of the solar water heating collector:

$$\eta = \frac{Q_{out}}{Q_{sun}} = \frac{m_{water} \cdot c_{water} \cdot \Delta T}{G_{sun} \cdot A_{col} \cdot \eta_{opt}} \quad (11)$$

Solution of this equation for variable allows to express dependence of collector efficiency on solar radiation density (G_{sun}) and ambient wind speed. The corresponding results are presented in the picture 2.

The graph shows five curves, each of which corresponds to a wind speed from 1.0 m/s to 5.0 m/s. The intensity of solar radiation on the abscissa varies from 0 to 1000 W/m².

By analyzing the curves, several conclusions can be drawn:

1. *Efficiency and intensity of solar radiation:* All curves show a positive trend, confirming that with an increase in the intensity of solar radiation, the efficiency of the solar collector increases. This is expected since solar energy falling on the collector will lead to an increase in heating and, accordingly, a higher heat input.

Picture 2. Dependence of solar collector efficiency (DSCE) from solar radiation density and wind speed

2. *Wind speed:* The graph shows that at lower wind speeds (1.0 and 2.0 m/s) the curves are steeper, which indicates higher efficiency under these conditions.

3. *Effect of high wind speed:* At a wind speed of 5.0 m/s, the curve has a flatter slope over the entire range of radiation intensity, which indicates that high wind speed leads to an increase in thermal losses, reducing the overall efficiency of the system.

4. *Optimal operating conditions:* The optimal conditions for the operation of the solar collector are presented on the lower curve with the lowest wind speed, where even at low solar radiation intensity, the collector shows relatively high efficiency.

5. *The dependence of efficiency on the change in both factors:* Graphic shows that the optimal performance of the solar collector is achieved with a specific combination of solar intensity due to radiation and wind speed, and that for each wind speed there is a different efficiency curve.

Thus, the graph emphasizes the importance of taking into account both solar radiation intensity and wind speed in the design and operation of solar water heating collectors in order to achieve maximum efficiency.

3 Discussion

Key study results

The study is aimed at assessing the interaction between solar radiation intensity, wind speed and sol-non reservoir performance. Key results show that the intensity of solar radiation has a direct positive effect on the efficiency of the solar collector, while the wind speed has a difficult effect: a moderate increase in efficiency at low speeds and a significant decrease at high ones.
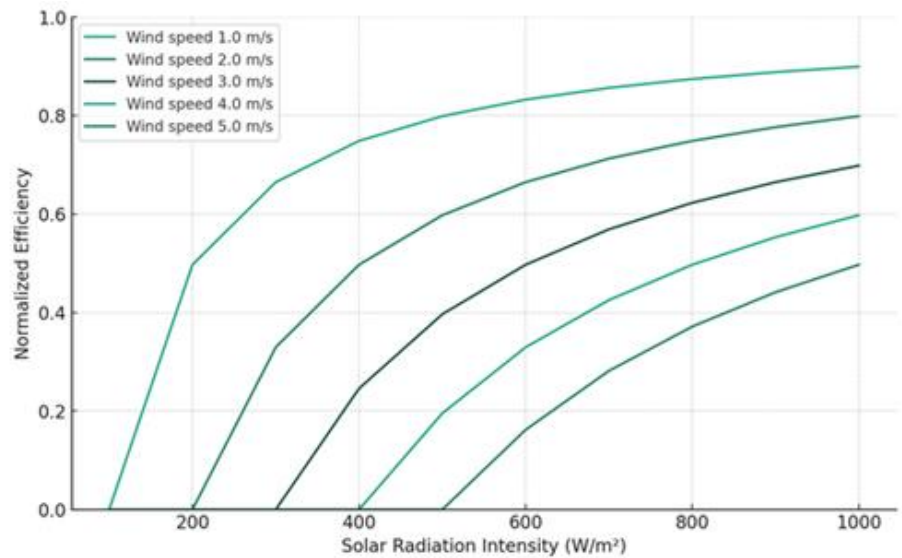
Comparison with previous studies

The results obtained in our study are in good agreement with studies [6-8,9] showing an increase in thermal efficiency of collectors with an increase in the intensity of solar radiation. One question of the influence of wind speed remained less studied. In our study, it was revealed that a small wind can act as a temperature regulator, while a strong wind leads to excessive thermal losses.

Explaining the results

The efficiency of solar collectors at low wind speeds can be explained by a decrease in the risk of overheating and an increase in thermal efficiency. At higher wind speeds, intensive cooling probably leads to an increase in thermal losses, which reduces the overall efficiency of the system.

Study limitations

Our results are based on data obtained in a continental climate with four seasons, which may limit their application in regions with different climatic conditions. In addition, the study was conducted using a certain type of solar collectors, which can also affect the generalizability of the results.

Directions for future research

Based on the results of this study, an in-depth study of the effect on different types of solar collectors of various meteorological conditions, including the combined effect of wind speed and solar radiation intensity is recommended. It is also important to investigate the effects of air humidity and atmospheric pressure.

Our results significantly expand the understanding of the impact of wind speed on the performance of solar collectors and provide valuable information for their optimization. They emphasize the importance of a complex approach to the design and operation of solar energy systems adapted to local meteorological conditions for maximum efficiency of actually manufactured structures.

4 Conclusion

Based on a comprehensive analysis of meteorological data and practical results of solar collectors, we formulated the following key conclusions:

1.The intensity of solar radiation is the main factor that determines the performance of solar collectors. The direct connection between the intensity of solar radiation and the efficiency of the collector is confirmed: with an increase in intensity up to 1000 W/m ^{2}**,** an increase in thermal power occurs.

2. Wind speed has a significant impact on reservoir efficiency, as clearly shown in the graph. At low wind speeds up to 2.0 m/s, productivity increases, probably due to effective cooling. It helps to maintain the reservoir temperature in the optimal range, which allows increasing the heat output and, as a result, the efficiency of the system.

With an increase in wind speed over 3.0 m/s, the cooling effect will fall. Increasing airflow can lead to increased heat loss through convection, which reduces the overall heat balance of the system. Moreover, at very high wind speeds, as shown for 5.0 m/s, it is possible to increase negative phenomena, such as vibration and a change in the angle of absorption of radiation, which further reduces the efficiency of the collector.

3. Optimal operating conditions of the solar collector are achieved at low wind speeds and high solar radiation intensity. The data show that for maximum efficiency, collectors should be operated in conditions with low wind speed.

4. The practical application of the research results is expressed in improving the design of solar collectors, especially their ability to resist the negative effects of wind and perceive solar radiation as fully as possible.

5. Recommendations for future research include an analysis of the impact of cloud cover, air humidity and other meteorological conditions on the performance of solar collectors. It will be useful to study the long-term energy production of collectors, taking into account the change of seasons and various climatic conditions.

In conclusion, this study makes a significant contribution to the development of solar energy, offering valuable practical recommendations for improving the design and operation of solar collectors. The results are important for the scientific community, as they cover hitherto unexplored aspects of the influence of wind speed and solar radiation intensity on the efficiency of solar collectors, and have significance for society as a whole, emphasizing the need to spread renewable energy sources for energy security.

References

[1].Abidov, A., Ryspaev, T., Satybaldyev, A., Gorbacheva, A. Comparative Analysis of Some Types of Renewable Energy Sources. Proceedings of International Conference on Applied Innovation in IT, 2019, 7(2), pp.15–20.

[2]S.V. Kiseleva, Y.G. Kolomiets and O.S. Popel, "Assessment of solar energy resources in central asia", Applied solar energy, no. 3, vol. 51, 2015, pp. 214-218.

[3] A.I. Ismanzhanov, A.B. Satybaldyev and O.U. Dilishatov, "Estimat ing the economic efficiency of solar units in mountain conditions", Applied solar energy, no. 3, vol. 41, 2005, pp. 36-38.

[4] S. Jaisankar, J. Ananth, S. Thulasi, S.T. Jayasuthakar, K.N. Sheeba,A comprehensive review on solar water heaters,Renewable and Sustainable Energy Reviews,Volume 15, Issue 6,2011,Pages 3045-3050,ISSN 1364-0321,https://doi.org/10.1016/j.rser.2011.03.009.

[5] Shiva Gorjian, Hossein Ebadi, Francesco Calise, Ashish Shukla, Carlo Ingrao, A review on recent advancements in performance enhancement techniques for low-temperature solar collectors, Energy Conversion and Management,Volume 222,2020,113246,ISSN 0196-8904, https://doi.org/10.1016/j.enconman.2020. 113246.

[6] Mohammed Abu Mallouh, Hossam AbdelMeguid, Mohammad Salah, A comprehensive comparison and control for different solar water heating system configurations, Engineering Science and Technology, an International Journal,Volume 35,2022,101210,ISSN 2215-986, https://doi.org/10.1016/j.jestch. 2022.101210.

[7] Dimitrios I. Ladas, Theodore Stathopoulos, Efstratios Dimitrios Rounis,
Wind effects on the performance of solar collectors on rectangular flat roofs: A wind tunnel study, Journal of Wind Engineering and Industrial Aerodynamics,Volume 161,2017,Pages 27-41,ISSN 0167-6105, https://doi.org/10.1016/j.jweia. 2016.12.008.

[8] Viacheslav Shemelin, Tomáš Matuška, The effect of the wind conditions on the thermal performance of an unglazed solar thermal collector,Energy Reports,
Volume 10,2023, Pages 2880-2888,ISSN 2352-4847, https://doi.org/10. 1016/j.egyr.2023.09.132.

[9] Yoshiki Nishi, Tomokazu Sema, Estimation of exergy efficiency of compound parabolic concentrator under time-varying cloud cover condition, Solar Energy, Volume 98, Part C,2013,Pages 341-348,ISSN 0038-092X, https://doi.org/10.1016/j.solener.2013.10.010.

[10] "The Climate of Kyrgyzstan" by M.I. Zimina (1961).

[11] "Climate and Natural Resources of Kyrgyzstan" by S.N. Alexeyev (1981).

[12] Climatic Profile of the Kyrgyz Republic. – Ilyasov Sh., Zabenko O., Gaidamak N., Kirilenko A., Myrsaliev N., Shevchenko V., Penkina L. – 2013 – 99 pages.

[13]"Assessment of Climate Change in Kyrgyzstan" by D.N. Ushakov et al. (2018).https://www.gfdrr.org/sites/default/files/publication/climate-change-country-profile-2011-kyrgyz-republic.pdf

[14]Md. Rashid Al-Mamun, Hridoy Roy, Md. Shahinoor Islam, Md. Romzan Ali, Md. Ikram Hossain, Mohamed Aly Saad Aly, Md. Zaved Hossain Khan, Hadi M. Marwani, Aminul Islam, Enamul Haque, Mohammed M. Rahman, Md. Rabiul Awual, State-of-the-art in solar water heating (SWH) systems for sustainable solar energy utilization: A comprehensive review,Solar Energy,Volume 264,2023,111998,ISSN 0038-092X,https://doi.org/10.1016/j.solener.2023.111998.

[15] Sujit Kumar Verma, Naveen Kumar Gupta, Dibakar Rakshit,A comprehensive analysis on advances in application of solar collectors considering design, process and working fluid parameters for solar to thermal conversion,Solar Energy,Volume 208,2020,Pages 1114-1150,ISSN 0038-092X,https://doi.org/10.1016/j.solener.2020.08.042.

[16] Abdellah Shafieian, Hossein Parastvand, Mehdi Khiadani,Comparative and performative investigation of various data-based and conventional theoretical methods for modelling heat pipe solar collectors,Solar Energy,Volume 198,2020,
Pages 212-223,ISSN 0038-092X,https://doi.org/10.1016/j.solener.2020.01.056.

[17] Dengjia Wang, Bohao Fan, Yaowen Chen, Ya Han, Yanfeng Liu, Yingying Wang, Huaican Liu, Xuefeng Jiao,Comparative analysis of heat loss performance of flat plate solar collectors at different altitudes,Solar Energy,Volume 244,2022,
Pages 490-506,ISSN 0038-092X,https://doi.org/10.1016/j.solener.2022.08.060.

[18] Nugroho Agung Pambudi, Iksan Riva Nanda, Andi Dwi Saputro,The energy efficiency of a modified v-corrugated zinc collector on the performance of solar water heater (SWH),Results in Engineering,Volume 18,2023,101174, ISSN 2590-1230, https://doi.org/10.1016/j.rineng.2023.101174.

[19] Duffy, J., Beckman, W.A. Thermal Processes Using Solar Energy. Moscow: Mir Publishers, 1977. - 420 p.

[20] Anderson, B. Solar Energy (Fundamentals of Architectural Design). Moscow: Stroyizdat, 1982. - 327 p.

[21] Avezov, R.R., Orlov, A.Y. Solar Heating and Hot Water Supply Systems. Tashkent: Fan, 1988. - 288 p.

Intelligent Control and Efficiency Improvement Methods for Parallel Pumping Systems

Usmonov Shukurillo Yulbarsovich[1] iD orcid: 0000-0002-3886-2242
e-mail: shusmonov1976@gmail.com

Muslimjon Sharipov Salimjon Ugli[2] iD orcid: 0009-0007-0704-6975
e-mail: muslimjonsharipov582@gmail.com

Eraliyev Abbosbek Solohiddin o'g'i[3] iD orcid: 0009-0000-8167-563X
e-mail: aeraliyev@gmail.com

[1,2,3]Fergana Polytechnic Institute, Fergana ,150100, Uzbekistan

Annotation: This research presents an intelligent control algorithm to improve the energy efficiency of parallel centrifugal pumping systems, widely used in industrial and municipal applications. Parallel pumping systems are vital for handling variable flow demands and ensuring operational reliability. However, conventional control methods often lead to energy inefficiencies due to suboptimal operation and static control mechanisms. The study begins by modeling the dynamics of parallel pumping systems, considering parameters such as flow rate, head, and energy consumption. Using pump performance curves and affinity laws, the proposed control algorithm dynamically adjusts pump operations based on real-time demand, ensuring optimal energy efficiency. Unlike traditional methods, the algorithm eliminates the need for startup measurements and integrates adaptive staging and de-staging techniques. Experimental results show that the intelligent control algorithm improves energy efficiency by 15% compared to traditional methods. The methodology includes simulation and experimental validation. MATLAB/Simulink simulations verify the algorithm's effectiveness under varying operational conditions, while a prototype system with DSP-based VFD controllers demonstrates its practical applicability. The results indicate significant energy savings, enhanced operational stability, and reduced wear and tear compared to conventional methods. The proposed approach offers scalability and adaptability, making it suitable for diverse applications such as power generation, wastewater treatment, and industrial processes. This work contributes to the development of sustainable and energy-efficient solutions for industrial systems.

Key words: Parallel pumping systems, intelligent control, energy efficiency, machine learning, IT, adaptive algorithms, predictive maintenance, operational stability, real-time monitoring, scalability.

1. Introduction

In industrial and commercial sectors, energy efficiency has become a key focus area due to rising energy costs and the need for sustainable operations. Among the largest energy consumers in these sectors are pumping systems, especially centrifugal pumps, which account for nearly a third of energy usage in many industries. This highlights the critical need for optimizing the efficiency of such systems to achieve significant energy savings.[1-4]

Parallel pumping systems are widely preferred for their flexibility in handling variable flow demands. By utilizing multiple smaller pumps instead of a single large pump, industries can reduce downtime during maintenance and adjust capacity more effectively. However, traditional control methods often fail to fully leverage the potential energy savings these systems offer. Conventional approaches, such as fixed-speed operation or simple on/off staging of pumps, frequently operate without considering energy efficiency, leading to unnecessary power losses and increased operational costs. [5-7]

The development of advanced control strategies, such as those based on Variable Frequency Drives (VFDs), has shown promise in addressing these inefficiencies. VFDs enable dynamic adjustment of pump speeds, ensuring

that pumps operate closer to their best efficiency points (BEP). However, many existing control systems lack robust algorithms for real-time optimization of parallel pump operation. Additionally, traditional control methods often require detailed system curve measurements, which can be both time-intensive and impractical in dynamic industrial environments.

This research aims to bridge these gaps by introducing a novel intelligent control algorithm for parallel centrifugal pumping systems. Unlike traditional methods, the proposed algorithm uses manufacturer-provided pump performance data to estimate system efficiency and optimize pump operation dynamically. Key features of the proposed approach include:

1. Energy-efficient staging and de-staging of pumps without the need for initial system curve measurements.
2. Enhanced flow rate compensation, ensuring optimal performance under varying load conditions.
3. Scalability and applicability to diverse industrial settings, including power generation, wastewater treatment, and process industries.

To validate the proposed control strategy, the study employs both simulation and experimental methodologies. The system modeling is carried out using MATLAB/Simulink, while experimental validation is conducted on a hardware setup integrated with a DSP-based VFD controller. The experimental results demonstrate that the algorithm achieves substantial energy savings and improved operational stability, making it a practical solution for real-world applications.

Through this work, we aim to contribute to the growing demand for intelligent, energy-efficient solutions in industrial operations, ultimately supporting the broader goals of energy conservation and sustainability.

2. Materials and Methods

Overview of Parallel Pumping Systems

Pumping systems are integral to converting electrical energy into hydraulic energy, utilizing pumps, motors, and Variable Frequency Drives (VFDs). In parallel pumping configurations, multiple pumps work together to handle fluctuating flow rate and head demands. This method, often referred to as cascade pumping, ensures operational flexibility and system efficiency through staged activation or deactivation of pumps.

The performance of centrifugal pumps is analyzed using characteristic curves that depict the relationship between flow rate, head, power consumption, and efficiency. These curves are essential for determining the optimal operating point of the system. By adhering to the affinity laws, centrifugal pumps achieve significant energy efficiency improvements when operated at reduced speeds. The developed head, calculated from the pressure differential, is expressed as:

$$H = (Ps - Pt)/pg$$

In parallel configurations, the cumulative flow rate is the sum of individual pump contributions, while the system operates at the common head of all pumps. The operating point is determined by the intersection of the system's head curve with the pump performance curve. Ensuring that each pump operates within its optimal range is crucial to maintaining efficiency and avoiding operational issues such as vibrations and wear.

Energy-Efficient Control for Parallel Pumps

A new control algorithm has been developed to enhance the energy efficiency of parallel pumping systems. This innovative approach addresses the limitations of conventional methods and introduces several benefits:

Optimized Efficiency: The algorithm dynamically adjusts pump operation to keep each unit close to its Best Efficiency Point (BEP), reducing energy losses.

Real-Time Control: Pump staging and speed adjustments are based on live system data, allowing the control to adapt to changing flow and head requirements.

Energy and Cost Reduction: Compared to traditional methods, the proposed control significantly lowers energy consumption, resulting in cost savings and a smaller environmental footprint.

Prolonged Pump Life: By avoiding overloading and maintaining balanced operation, the control minimizes mechanical stress, enhancing the durability of the pumps.

This energy-efficient control method offers a robust and adaptive solution for industries requiring reliable and cost-effective pumping operations. It demonstrates scalability and applicability across a range of industrial scenarios, including water supply, wastewater treatment, and process systems.

3 Results and Discussion

The following is the mathematical model for the multi-drive, multi-pump system, focusing on pump dynamics, energy consumption, and the control algorithm for optimal operation:

Pump Dynamics

For each pump in the system, the dynamic model can be expressed as:

$$Q_i = K_i \cdot N_i$$

where:

Q_i - is the flow rate of pump i (m³/h),

N_i - is the speed of pump i (rpm),

K_i is the flow coefficient for pump i.

The head H_i generated by each pump is related to the flow rate by:

$$H_i = H_{i0} - C_i \cdot Q_i^2$$

Energy Consumption Model

The power consumed by each pump P_i is a function of the flow rate, head, and pump efficiency η_i:

$$P_i = \frac{Q_i \cdot H_i \cdot \rho \cdot g}{\eta_i}$$

The total energy consumed over time E_i for pump i is:

$$E_i = \int_0^T P_i(t)\, dt$$

    The control algorithm aims to optimize the operation of each pump by adjusting the speed N_i to minimize energy consumption while meeting system demands (flow rate Q_{demand} and head H_{demand}).

    The control input $u_i(t)$ for each pump is the speed adjustment signal, and the goal is to minimize the following cost function:

$$J = \sum_{i=1}^{n} \int_0^T \left(P_i(t) + \lambda \cdot \left(Q_i(t) - Q_{demand}(t)\right)^2 + \mu \cdot \left(H_i(t) - H_{demand}(t)\right)^2 \right) dt$$

$P_i(t)$ is the instantaneous power consumption of pump i,

$Q_i(t)$ and $H_i(t)$ are the flow rate and head of pump i at time t,

λ and μ are weighting factors that prioritize minimizing energy consumption versus maintaining the required flow and head.

ANN-Based Optimization

    The control algorithm is integrated with an artificial neural network to predict the optimal speed N_i for each pump based on the current system state. The ANN is trained with historical data to predict the power consumption $\hat{P}_i$ and efficiency $\hat{\eta}_i$ for each pump.

The optimal speed N_i^* is determined by solving:

$$N_i^* = \arg\min \hat{P}_i(N_i) \text{ subject to } Q_i \geq Q_{demand}, H_i \geq H_{demand}$$

The results demonstrated that the ANN could accurately predict energy consumption patterns under various operating conditions. For both single pump and combined pump operations, the predicted energy usage closely matched the observed values, with a mean prediction error of less than 5%.

Tab. 1.

Energy consumption prediction for pumps using artificial neural networks is shown in Tab. 1

Scenario	Pump 1 (kWh)	Pump 2 (kWh)	Pump 3 (kWh)	Total Energy Consumption (kWh)
Traditional System	3200	3100	3300	9600
Artificial Neural Network	2800	2700	2900	8400
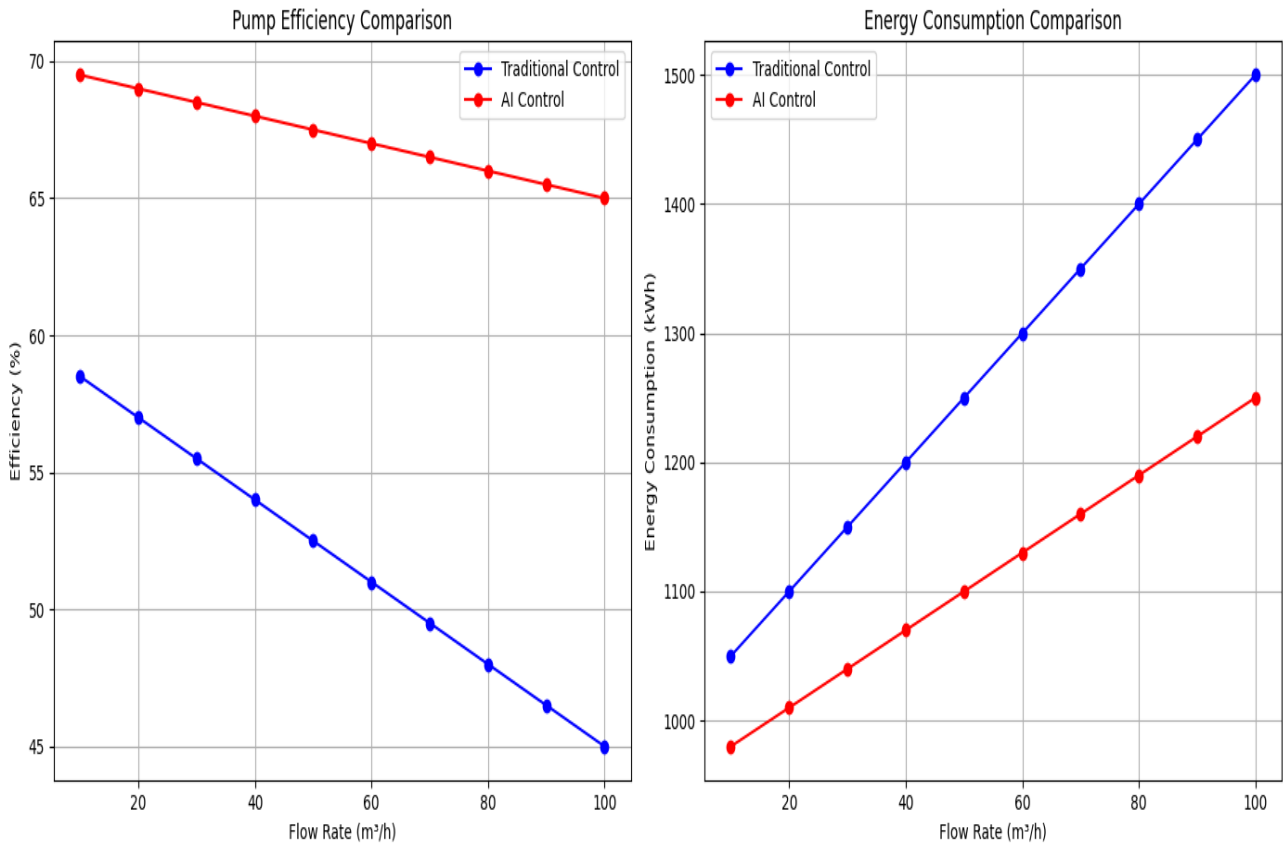
These charts highlight the superior energy efficiency and operational performance of AI-based control systems. Fig 2

4 Conclusion

This study presents a novel energy-efficient control algorithm for parallel pumping systems, offering significant improvements over traditional control methods. The proposed algorithm dynamically adjusts pump speeds and stages based on real-time demand, ensuring that all pumps operate near their Best Efficiency Point (BEP). Experimental results demonstrated energy savings ranging from 15% to 45%, particularly in the flow rate range of 1.5 to 6 m³/hr, where system efficiency was maximized. Additionally, the algorithm minimized operational wear and tear, enhancing pump longevity and system reliability. Its adaptability and scalability make it

a practical solution for various industrial applications, such as water distribution and wastewater treatment. By achieving optimal energy use and improving operational stability, this intelligent control method contributes to sustainable energy practices and cost-efficient industrial operations. Future work could explore integrating sensor-less control techniques for broader applicability and further cost reductions.

References

1. V. Vodovozov, T. Lehtla, I. Bakman, Z. Raud, and L. Gevorkov, " Energy-efficient predictive control of centrifugal multi-pump stations" 15th Biennial Baltic Electronics Conference (BEC2016) Tallinn, Estonia, October 3-5, 2016 http://www.elin.ttu.ee/bec

2. S.Mirchevski "Energy Efficiency in Electric Drive" ELECTRONICS, VOL. 16, NO. 1, JUNE 2012.

3. V. Vodovozov and Z. Raud "Predictive Control of Multi-Pump Stations with Variable-Speed Drives", Tallinn, Estonia 2016. https://doi.org/10.1049/iet-epa.2016.0361

4. Qahtani, K., E-M., R., Gheeth, A.: 'Large synchronous motor failure investigation; measurements, analysis and lessons learned', IEEE Trans. Ind. Appl., 2016, PP, (99), pp. 1–1. http://dx.doi:10.1109/TIA.2016.2592461

5. Kini, P.G., Bansal, R.C.: 'Effect of voltage and load variations on efficiencies of a motor-pump system', IEEE Trans. Energy Convers., 2010, 25, (2), pp. 287–292. http://dx.doi:10.1109/TEC.2009.2032628

6. Carlson, R.: 'The correct method of calculating energy savings to justify adjustable-frequency drives on pumps', IEEE Trans. Ind. Appl., 2000, 36, (6), pp. 1725–1733. http://dx.doi:10.1109/28.887227

7. Arribas, J.R., González, C.M.V.: 'Optimal vector control of pumping and ventilation induction motor drives', IEEE Trans. Ind. Electron., 2002, 49, (4), pp. 889–895. http://dx.doi:10.1109/TIE.2002.801240

8. Enslin, J.H.: 'Power system infrastructure: Do we face a complete power-electronics-based power system and energy-storage infrastructure?', IEEE Power Electron. Mag., 2016, 3, (2), pp. 42–45

9. Rakibuzzaman, S., Suh, S.-H., Kyung-Wuk, K., et al.: 'A study on multistage centrifugal pump performance characteristics for variable speed drive system', Procedia Eng., 2015, 105, pp. 270–275

10. Georgescua, A.-M., Georgescub, S.-C., Cosoiua, C.I., et al.: 'EPANET simulation of control methods for centrifugal pumps, operating under variable system demand', Procedia Eng., 2015, 119, pp. 1012–1019

11. Shukurillo Yulbarsovich, U., Ruzimatjon Anvarjon Ugli, S., Musulmonkul Imomali Ugli, M., Saleem, A., & Dilnoza Toptiyevna, K. (2024). Increase the operational reliability of the electric drive of the weaving machine. International Journal of Power Electronics and Drive Systems (IJPEDS, 15(2), 704–714. https://doi.org/10.11591/ijpeds.v15.i2.pp704-714

12. Modelling and implementation of a photovoltaic system through improved voltage control mechanism Shukurillo Usmonov, Atif Iqbal, Adeel Saleem, Kholiddinov Ilkhombek Khosiljonovich, Uzbekov Mirsoli Odiljanovich, Eraliev Khojiakbar Abdinabi Ugli, Mamadaliev Musulmonkul Imomali Ugli International Journal of Power Electronics and Drive Systems (IJPEDS) Vol. 15, No. 1, March 2024, pp. 412~421 ISSN: 2088-8694, DOI: 10.11591/ijpeds.v15.i1 .pp412-421

13. M. A. Samad, Shukurillo Yulbarsovich, U, Shukurillo Yulbarsovich, U, S. Siddiqui. Advanced control and optimization strategies for a 2-phaseinterleaved boost converter. Indonesian Journal of Electrical Engineering and Computer Science. Vol. 36, No. 3, 2024, pp. 1421-1429. DOI: 10.11591/ijeecs.v36.i3.pp1421-1429

14. Murodil Madaliev*, Mavlonbek Usmonov, Zuhriddin Umirzakov, Shukurillo Usmonov, Muslimbek Ismoilov, Zarifjon Adilov and Nigora Alimova. Comparison modern of turbulence models for the 2D NASA wall-mounted hump separated flow problem. https://doi.org/10.1051/e3sconf/202453801013

Research of the Solution of the Operator-Differential Equation in Partial Derivatives of the Fourth Order

Aizharkyn Akzholtoeva [1] orcid: 0009-0007-0704-6975
e-mail: aijarkyn.osh@mail.ru

Zamira Zholdoshova[2] orcid: 0009-0004-5540-4413
e-mail: chebire86@mail.ru

Zhoomart Moldaliev [3] orcid: 0009-0002-0199-6420
e-mail: zhoomart_mambetov@mail.ru

[1,2,3]Osh Technological University named after M.Adyshev, Osh, Kyrgyzstan

Abstract: Physical problems are modeled by fourth order partial differential equations. Solving such nonlinear equations poses a lot of difficulties. Recently, the method of an additional argument (MAA) has been used to study the solution of higher order partial differential equations. In this work, using the specified method, we prove the existence of a solution to an operator-differential equation in partial derivatives of the fourth order with given initial conditions. Additional conditions are included for functions specified in the initial conditions.

Keywords: Differential equations, partial derivatives, fourth order, nonlinear, the method of an additional argument, initial conditions.

1 Introduction

There is considered the equation in operator form for a more detailed review of the literature:

$$D^n[B(t,x;u]u(t,x) = F(t,x;u), \qquad (*)$$

where *B, F* are functions or operators concerning the unknown functions u, $n \in N$, $D[\omega] = \dfrac{\partial}{\partial t} + \omega \dfrac{\partial}{\partial x}$.

The method of an additional argument (MAA) was initially used for first-order equations. In work [6], the existence and uniqueness of the solution to equation (*) with the initial condition are proved.

$$u(0,x) = \varphi(x), \ x \in R. \qquad (**)$$

and with the following data:

$$n = 1, \quad B(t,x;u) = u(t,x), \ F = f(t,x,u(t,x), \int_{-\infty}^{\infty} K(x,\xi)u(t,\xi)d\xi), \quad 0 \le t \le T^*,$$

where T^* determined from the source data.

The problem (*) – (**) was considered in [5]:

$$n = 1, \quad B(t,x;u) = \int_0^1 u(t,\xi)d\xi, \quad F = f(t,x,u(t,x)),$$

Using the MAA, the initial problem was reduced to an integral equation of three independent variables, and the existence of a solution was proven.

At $n = 1, \quad B(t,x;u) = u(t,x), \quad F = \int_{-\infty}^{\infty} K_0(x-\xi)u_\xi(t,\xi)d\xi$

equation (*) was studied in works [2,3, 10].

The issues of classification and reduction to canonical form of fourth-order linear differential equations and the construction of the Riemann function for fourth-order hyperbolic equations are considered in [4].

It was established that the method of an additional argument makes it possible to quite effectively determine the solvability conditions of the Cauchy problem for systems of equations in [6], [9,11].

Using the basic ideas of the method of an additional argument in [7,8], differential and integro-differential partial differential equations of the Korteweg-de Vries type, as well as nonlinear wave equations, were studied.

We use function classes and results from [1].

2 Formulation of the problem

We consider the nonlinear operator-differential equation (NODE) in partial derivatives (PD) of the form:

$$D^2[-u(t,x]D^2[u(t,x)]u(t,x) = F(t;u), \quad G_2(T) = [0,T]\times R, \qquad (1)$$

where $n,m \in N,\ T \in R_{++}$ - some given number,

$F(t;u) -$ operator depending only on t for any function u and for which the conditions are met:

1. $F-$ uninterrupted;

2. By $L>0$ and for $T^* \le T$ condition is met:

$$\| F(t,x;u_1(s,\xi):s,\xi) - F(t,x;u_2(s,\xi):s,\xi) \|_{G_2(T^*)} \le L \| u_1(t,x) - u_2(t,x) \|_{G_2(T^*)},$$

Let's write equation (1) for a special case:
$$D[-u(t,x]D[u(t,x)]u(t,x) = u_{tt}(t,x) - u^2(t,x)u_{xx}(t,x) +$$
$$+ u_x(t,x)[u_t(t,x) - u(t,x)u_x(t,x)] = F(t;u).$$

$\overline{C}^{(k)}(\Omega)$ - the space of defined, continuous and bounded functions, together with all their derivatives up to order k on Ω.

Along with equation (1), we consider the initial conditions (IC):

$$\frac{\partial^k u(t,x)}{\partial t^k}\bigg|_{t=0} = \psi_k(x), \quad k = 0,1,2,3, \qquad (2)$$

where $\psi_k(x) \in \overline{C}^{(4)}(R), \quad k = 0,1,2,3.$

3 Results

Theorem. Let be:

1) for F, conditions 1,2 are satisfied.

2) the functions $\psi_k(x) \in \overline{C}^{(4)}(R), \quad k = 0,...3$ satisfy the conditions:

$$D[-u(t,x)]D^2[u(t,x)]u(t,x)\big|_{t=0} = 0,$$

$$D^2[u(t,x)]u(t,x)\big|_{t=0} = 0.$$

Then problem (1)-(2) has a unique solution $u(t,x) \in \overline{C}^{(4)}(G_2(T^*))$, where $T^* \leq T$ is determined from the data of the initial problem (1), (2).

Proof.

We carry out the proof of the theorem with proofs of a number of lemmas. We use the following notation:

$$p(\tau,t,x;u) = x - \int_\tau^t u(s, p(s,t,x))ds, \qquad (3)$$

Since it is a function $u(t,x) \in \overline{C}^{(4)}(G_2(T))$, satisfies the Lipschitz condition for x with some number L>0.

Lemma 1. From (3) the identity follows:

$$p(\tau,t, p(t,\theta,x;u);u) = p(\tau,\theta,x;u), \quad (\tau,t,\theta,x) \in Q_3(T), \qquad (4)$$

$$Q_n(T) = \{(t_1,t_2,t_3,...,t_n,x) \big| 0 \leq t_1 \leq t_2 \leq t_3 \leq ... \leq t_n \leq T, x \in R\}.$$

Proof. In (3) we replace x by $p(t,\theta,x;u)$:

$$p(\tau,t, p(t,\theta,x;u);u) = p(t,\theta,x;u) - \int_\tau^t u(s, p(s,t, p(t,\theta,x;u);u))ds,$$

$$p(\tau,\theta,x;u) = x - \int_\tau^\theta u(s, p(s,\theta,x;u))ds.$$

Using the notation $q(\tau,t,\theta,x;u) = |p(\tau,t, p(t,\theta,x;u);u) - p(\tau,\theta,x;u)|,$

We have:

$$|p(\tau,t, p(t,\theta,x;u);u) - p(\tau,\theta,x;u)| \leq \Big|x - \int_t^\theta u(s, p(s,\theta,x;u))ds - \int_\tau^t u(s, p(s,t, p(t,\theta,x;u);u))ds -$$

$$-x + \int_\tau^\theta u(s, p(s,\theta,x;u))ds\Big| \leq \Big|-\int_t^\theta u(s, p(s,\theta,x;u))ds + \int_\tau^\theta u(s, p(s,\theta,x;u))ds -$$

$$-\int_\tau^t u(s, p(s,t, p(t,\theta,x;u);u))ds\Big| \leq \int_\tau^t L|p(s,t, p(t,\theta,x;u);u) - p(s,\theta,x;v)|ds.$$

From the last expression using the introduced notation we have

$$q(\tau,t,\theta,x;u) \le \int_{\tau}^{t} Lq(s,t,\theta,x;u)ds. \tag{5}$$

From (5) we get:

$$q(\tau,t,\theta,x;u) \equiv 0$$

and (4) has proven.

For formula (4) we use the following notation:

$$v(\tau,t,x) = u(\tau, p(\tau,t,x;u)).$$

Therefore, from (4) we have:

$$p(\tau,t,x;v) = x - \int_{\tau}^{t} v(s,t,x)ds, \tag{6}$$

It should be noted that if

$$D[v(t,t,x)]v(\tau,t,x) = 0, \tag{7}$$

then

$$D[v(t,t,x)]p(\tau,t,x;v) = 0. \tag{8}$$

Let's introduce the operator

$$A(t,x;v) = \psi_0(p(0,t,x;v)) + t\varphi(p(0,t,x;v)) + \int_0^t (t-\rho)I(\rho;u)d\rho \tag{9}$$

$$I(t;u) = \int_0^t (t-s)F(s;u)ds, \quad \left(D[u(t,x)]u(t,x)\right)\big|_{t=0} = \varphi(x).$$

Lemma 2. If (7) is satisfied,

$$v(\tau,t,x) = A(\tau, p(\tau,t,x;v);v) \tag{10}$$

$$u(t,x) = v(t,t,x), \tag{11}$$

then the function is a solution to problem (1), (2), and vice versa.

Proof. We can introduce a few notations to simplify the proof:

$$z(t,x;u) = D^2[u(t,x)]u(t,x),$$

$$z_1(t,x;u) = D[-u(t,x)]z(t,x;u),$$
$$z_2(t,x;u) = D[-u(t,x)]z_1(t,x;u).$$

$$\theta(t,x;u) = D[u(t,x)]u(t,x),$$

Therefore, the DE in PE (1) has the form:

$$D^2[-u(t,x)]z(t,x;u) = F(t;u). \tag{12}$$

From (12) we obtain:

$$D[-u(t,x)]z_1(t,x;u) = F(t;u). \tag{13}$$

We received the initial problem (13), (2). For this task we use the method of an additional argument (MAA). Then this problem comes down to solving the following equation:

$$z_1(t,x;u) = \int_0^t F(s;u)ds . \tag{14_1}$$

We see that it is easy to prove that (13) is true by differentiating equation (14_1). For $t=0$ in (14_1), we obtain $z_1(0,x;u) = 0$.

Next, we use MAA for problem (14_1), (2) and obtain:

$$z(t,x;u) = \int_0^t (t-s)F(s;u)ds . \tag{14_2}$$

Thus, applying MAA sequentially twice to (13), we get (14_2). The reverse case is also valid. That is, from equation (14_2), by sequentially differentiating it, we get (13).

Next, using the introduced notation from (14_2), we obtain:

$$D[u(t,x)]\theta(t,x;u) = \int_0^t (t-s)F(s;u)ds = I(t;u) . \tag{15}$$

We use MAA for problem (15), (2) and obtain:

$$\theta(t,x;u) = \varphi(p(0,t,x;v)) + \int_0^t I(\rho;u)d\rho , \tag{16_1}$$

$$\theta(t,x;u)\big|_{t=0} = \varphi(x).$$

By differentiating (16_1), we prove the inverse relationship:

$$D[u(t,x)]\theta(t,x;u) = \varphi'(p(0,t,x;v))D[u(t,x)]p(0,t,x;v) + I(t;u) .$$

Due to (8), (11) we obtain (15) and and $\theta(0,x;u) = \varphi(x)$.

From (16_1), (2) using MAA, we obtain:

$$u(t,x) = \psi_0(p(0,t,x;v)) + t\varphi(p(0,t,x;v)) + \int_0^t (t-\rho)I(\rho;u)d\rho , \tag{16_2}$$

And back differentiating (16_2) by t and x, we obtain (16_1).

In (16_2) at t=0 we have: $u(0,x) = \psi_0(x)$.

The lemma is proven.

Lemma 3. The solution to equation (10) satisfies equation (7), and the function $u(t,x)$ from (11) satisfies (9).

Proof. Let $v(\tau,t,x) \in \overline{C}^{(4)}(Q_2(T^*))$ be a solution to (10). Then from (10) by differentiation we obtain:

$$\omega(\tau,t,x) \equiv -(\varphi(p(0,t,x;v)) + \tau\psi_1'(p(0,t,x;v)))\int_0^t \omega(s,t,x)ds, \text{ where}$$

$$\omega(\tau,t,x) = D[v(t,t,x)]v(\tau,t,x).$$

This implies: $\omega(\tau,t,x) = 0$.

Therefore, (7) is true. When $\tau=t$ in (10) we obtain (11).

The lemma is proven.

Lemma 4. Equation (10) at $T^* < T$ has a solution in $\overline{C}(Q_2(T^*))$.

Proof. We use a more convenient representation of equation (10) in the form

$$v(\tau,t,x) = J(\tau,t;v), \qquad\qquad\qquad (17)$$

where $J(\tau,t;v) = A(\tau, p(\tau,t,x;v);v)$.

By $T^* < T$ we have:

$$\left| J(\tau,t;0) \right| = \left| A(\tau, p(\tau,t,x;0);0) \right| =$$

$$= \left| \psi_0(p(0,t,x;v)) + t\varphi(p(0,t,x;v)) + \int_0^t (t-\rho) I(\rho;u)d\rho \right| \le$$

$$| \left| \psi_0(p(0,t,x;v)) + t\varphi(p(0,t,x;v)) \right| + \int_0^t (t-\rho) | \int_0^\rho (\rho-s) F(s;0)ds | \le$$

$$\le |\psi_0| + t|\varphi| + \| F(t;0) \|_{[0,t]} \frac{t^4}{2!} \le \Omega_0(T^*),$$

where

$$\Omega_0(S) = \|\psi_0\| + \|\varphi\|S + \| F(t;0) \|_{[0,t]} \frac{S^4}{2!}.$$

$$\left| J(\tau,t;v_1) - J(\tau,t;v_2) \right| \le \left| \psi_0(p(0,t,x;v_1)) + t\varphi(p(0,t,x;v_1)) + \int_0^t (t-\rho) I(\rho;v_1)d\rho - \right.$$

$$\left. -\psi_0(p(0,t,x;v_2)) + t\varphi(p(0,t,x;v_2)) + \int_0^t (t-\rho) I(\rho;v_2)d\rho \right| \le$$

$$\le T^*\Omega_1 \| v_1 - v_2 \|_{G_2(T^*)},$$

где

$$\Omega_1 = \|\psi_0'\| + \|\varphi'\|T + \frac{T^4}{2!}.$$

Thus, the conditions of Lemma 4 are satisfied and we obtain that equation (10) has a solution in the space of functions with a norm of no more than $2\Omega_0(T^*)$.

The lemma is proven.

Lemma 5. All derivatives of the solution to equation (10) are continuous for sufficiently small values $T < T^*$.

Proof: Let's prove that $v(\tau,t,x) \in \overline{C}^{(4)}(Q_2(T^*)), u(t,x) \in \overline{C}^{(4)}(G_2(T^*))$.

Assuming $v_t \in \overline{C}$, we get estimates:

$$\left\| \frac{\partial A(\tau, p(\tau,t,x;v);v)}{\partial t} \right\| \le (\|\psi'_0\| + \|\varphi'\|t_0)(\|v\| + t_0\|v_t\|) = V_t = const < \infty.$$

$$\left\| \frac{\partial A(\tau, p(\tau,t,x;v_1);v_1)}{\partial t} - \frac{\partial A(\tau, p(\tau,t,x;v_2);v_2)}{\partial t} \right\| \le \Omega_1(t_0)\|v_{1t} - v_{2t}\|.$$

We also obtain estimates for $\dfrac{\partial A}{\partial x}$:

$$\left\| \frac{\partial A(\tau, p(\tau,t,x;v);v)}{\partial x} \right\| \le (\|\psi'_0\| + \|\varphi'\|t_0)(1 + t_0 \cdot \|v_x\|) = V_x = const < \infty.$$

$$\left\| \frac{\partial A(\tau, p(\tau,t,x;v_1);v_1)}{\partial x} - \frac{\partial A(\tau, p(\tau,t,x;v_2);v_2)}{\partial x} \right\| \le \Omega_1(T^*)\|v_{1x} - v_{2x}\|.$$

The following estimates are obtained:

$$\|u_t(t,x)\| \le \|\theta_1(t,x;u)\| + V_t, \quad \|u_x(t,x)\| \le V_x.$$

Continuing this process, we obtain the validity of the relations $v(\tau,t,x) \in \overline{C}^{(4)}(Q_2(T^*))$, $u(t,x) \in \overline{C}^{(4)}(G_2(T^*))$ для $n \ge 3$.

The lemma is proven.

We have proven all the lemmas. It is reasonable to say that we have proven the theorem based on these proofs.

4 Conclusion

In this work, the study of the local solution to a fourth-order operator-differential equation with partial derivatives was considered. Additional conditions were considered for the functions given in the initial conditions. The scheme for applying the method of an additional argument (MAA) presented in this work can be used in the study of solutions to other higher-order equations.

References

1. A.Zh. Ashirbaeva and E.A. Mamaziaeva, "Solution of a nonlinear operator-differential equation in partial derivatives of the second order using the additional argument method", (Vestnik KRSU, V.15, No.5. 2015), pp. 61–64.
2. M.I. Imanaliev and S.N. Alekseenko, "On the theory of nonlinear integro-differential partial differential equations of Whitham type" (Reports of the Russian Academy of Sciences, T. 323, No. 3. 1992), pp. 410–414.
3. M.I. Imanaliev, T.M. Imanaliev, U.M. Imanaliev, "On the theory of almost soliton solutions of nonlinear integro-differential equations in third order partial derivatives", (Research on integro-differential equations, – Bishkek: Ilim, 2004. – Issue. 33.), pp.17-23.
4. P.S. Pankov and O.D. Budnikova, "Numerical solution of the problem of the motion of Riemann waves based on the additional argument method", (Research on integro-differential equations. – Bishkek: Ilim, 2003. – Issue. 32), pp.35–38.
5. A.Zh. Ashirbaeva, "Approximate solution of the initial problem for nonlinear second-order partial differential equations using the additional argument method", (Research on integro-differential equations. – Bishkek: Ilim, – Issue 46, 2014), pp. 37–40.
6. A.Zh. Ashirbaeva and Ch.B. Zholdosheva, "Solution of a nonlinear integro-differential equation in partial derivatives of the second order of hyperbolic type" (Bulletin of Osh State University, Series of natural and medical sciences, Issue1, No. 2, 2012), pp. 144–149.
7. A.Zh. Ashirbaeva, "A new method for solving a general equation of hyperbolic type" (Mathematical education, 2018), pp.35-38.
8. A.Zh. Ashirbaeva and E.A. Mamaziaeva, "Solution of a nonlinear operator-differential equation in partial derivatives of the second order of hyperbolic type" (Science and new technologies, №2, 2015), pp. 8–11.
9. A.Zh. Ashirbaeva and E.A. Mamaziaeva, "Reduction of the nonlinear problem of electrical oscillations in wires to systems of integral equations using the method of additional argument" (Izvestia of OshTU, No.1, Osh, 2015), pp. 87–90.

Role of listening comprehension in teaching process of A2 level learners

Dinara Saitkhanova orcid: 0009-0004-1227-8154
e-mail: dinara.saitkhanova@mail.ru

PhD,Associate professor,Department of Foreign language and literature,
University of Tashkent for Applied Sciences, Gavhar Str. 1, Tashkent 100149, Uzbekistan

Abstract: This article is dedicated to demonstrate role of listening comprehension in teaching process of A2 level learners. Consequently, it considers new selected pedagogical interactive technologies and experimental suggestions to develop one of the perceptive skills for young learners at secondary schools. One of the essential contemporary educational issues in the field of foreign language acquisition is enhancing listening comprehension skills. Acquiring the effective ways of teaching listening can lead to considerable improvements in language pedagogy to teacher's advantage. The primary aim of the paper is to discuss the practical and methodological usefulness of the concept of the perception base of the language. It also highlights the role of structural features and frequency of linguistic units in helping to identify teaching priorities in English language teaching while working with A2 level learners, especially, for training listening skills.

Key words: Summarization, facilitate, interaction, intrinsic, extrinsic inferencing, motivation , self-confidence, foster, barriers receptive, elaboration, imagery, motivation

1 Introduction

It is obvious that the government of Uzbekistan always shows a great desire to educate the youth foreign languages to help them get good prospects for promotion in the world. Therefore, our present president SH. M. Mirziyoyev is trying to create new opportunities for youngsters to study abroad to develop their proficiency in foreign languages.

The impact of the new curriculum and EFL reform in Uzbekistan was huge on pre-service and in-service teacher training, materials design and teachers' continuing professional development areas. The new standard required the whole system of foreign languages teaching to rethink and reform the approaches used in educational institutions.

Listening skills play a significant role in dealing with any language and the English language is also not exception from this. As far as the researcher is concerned, to master this skill a learner needs some outer and/or inner effect or encouragement. And automatically this issue is related to comprehension. It goes without saying that when an applicant becomes a student, a great demand of focusing on language skills comes into being in front of the class. The researcher is going to hold an investigation about how to comprehend junior pupils to develop their listening skills. It has been continually disputing that learner's motivation helps to take in knowledge effectively and the ways leading to this mount has been sought, found and analyzed. Motivation gives a great inspiration in a particular action of a learner. This potency may cause several efficient consequences, for example, self-confidence of a learner is raised, intention to learn more and discover unknown sides of abilities is increased, positive opinions are appeared in the mind of a learner.

Regarding motivation, the main findings of this study indicate that student choices and learner autonomy are significant for enhancing student motivation. Also, the findings suggest that the use of student questions to promote communication from diverse perspectives is a significant motivational tool. The researcher observed lessons of some groups of freshmen pupils. An interest has born to take a research about listening skills and has chosen the relevance between motivation and listening skills in obtaining and developing fluent English. Nowadays the English language is paid attention very seriously. As it contains 4 main skills, listening is also one undeniable of

them. The result which is going to be expected is raised knowledge and changed attention of learners towards listening perception. Participants' listening comprehension of motivation is going to be measured by English motivation comprehension.

2 Materials and methods

A)Effectiveness of receptive skill

Listening is a skill that underlies rest of the necessary skills. It is the key to developing and maintaining relationships, making decisions and solving the problems. People spend as much as half of their communication time for listening. The importance of listening comprehension in L2 learning is now recognized very well. Researchers and textbook designers are more and more aware of its growing importance; they not only recommend that listening should be taught in L2 learning programs but insist that adequate materials and strategies should be used to teach it efficiently. Consequently, listening skills need to be encouraged and, most importantly, pupils must be shown the appropriate strategies when they are exposed to different listening materials. Listening involves hearing the speakers words, understanding the message and its importance to the speaker, and communicating that understanding to the speaker. The apparent problem is that among all the communication skills, listening is the earliest learned and the most frequently used, yet it seems to be the least mastered.

Listening is an essential and undervalued skill, notes. Why is it then that while the skill of listening is identified by many researchers as one of the most important qualities people can possess, poor listening is identified repeatedly as the most common deficiency? Unfortunately, listening skills are very often ignored or just taken for granted [1].

According to Hlaviso Albert Motlhaka, professor of Indiana University of Pennsylvania School of Graduate Studies and Research Department of English, listening skills are an essential aspect of the development of motivation which empowers pupils to develop their communication and critical thinking skills necessary for functioning competently in the ESL classroom.

It is quite clear that interactive listening is imperative in our daily life as we share ideas because we spend more time listening to one another in order to respond appropriately in an overall language learning as compared to other learning skills [2]. In the ESL classroom, it is easy to see that interactive listening plays a significant role in enhancing ESL pupils' comprehensible input and advancement of ESL learning when teachers create lesson plans that encourage pupils to connect the content to their own lives through listening because they are then able to learn on their own. For these reasons, this research contributes to a better understanding of the perceived ESL pupils' motivation and the strategies used by ESL teachers.

Besides that the development of active listening is essential to pupils' ability to negotiate language outside of the classroom. Given the relevance of this statement, it is clear that successful ESL interaction either between school teachers and learners, parents and children, medical personnel and patients or law enforcement officials and suspects, is primarily dependent on effective interactive listening skills.

Also learners in an interactive listening classroom have good learning opportunities to make it work, not merely to make it right, while negotiating meanings in interactive listening tasks. For example, teachers can give pupils contextualized listening activities in which pupils identify supporting details, which boost their listening ability and confidence to learn ESL. Therefore, motivation may come from the individual learner's emotional satisfaction or pleasure to make learning enjoyable through compelling interaction.

Cohen (1988) suggested that teachers should design a series of stimulating discussion activities that encourage pupils to express their points of view on a given topic, which advances pupils' comprehensible input and lets the class generate goals to be accomplished. To illustrate, teachers can demonstrate to pupils the benefits of what is taught in an ESL classroom by encouraging pupils to respect each other's viewpoints while praising pupils for attentively listening to one another.

Thus, what emerges from this discussion of motivation is the underlying theme of this research in which ESL pupils' desires and goals are generally related to their motivation and success to learn the foreign language and its culture. Finally, the discussion of intrinsic, instrumental motivation reveals that having a specific goal in ESL learning helps pupils focus their efforts and maintain their motivation.

In fact, several researchers have contended that listening skills are regarded by employers as a major requirement for employment of job seekers, as well as a significant skill for promotions (Brownell, 1993; Brownell & Janusik, 2002, as cited in Thompson et al., 2004; DiSalvo, 1980). This means that pupils' motivation to learn ESL through listening does not only facilitate ESL learning but also prepares them to be marketable in the job market. Scholars like Wolvin and Coakley (1996) suggest that institutions of higher learning should make every effort to expose pupils to listening activities and strategies that prepare them to become good listeners in order to meet employment requirements and become productive employees [3].

Listening is considered to be one of the four macro skills necessary for effective communication in any language according to most researches. As English is universally used as a means of communication, especially on the Internet, English speaking skills should be developed along with the other skills so that these integrated skills will enhance communication competence.

A number of researchers investigated speaking skills of pupils and came to the conclusion about pupils' low level of speaking ability and their inability to speak confidently and fluently. One among the many reasons to take into consideration might be the lack of confidence and anxiety about making errors as stated by Cohen (1988) and in other related studies. Most pupils are not confident in their ability to learn; teachers must overcome their reluctance in order to change this situation.

3 Result

Classroom interaction is also necessary and useful as an educational strategy to enhance listening skills. The role of interaction in a classroom context in enhancing listening skills comes from the understanding of its main types: teacher-learner interaction and learner-learner interaction, where negotiation of meaning and the provision of feedback are highlighted. Classroom interaction involves verbal exchanges between learners and teachers. Teachers should know that the learners need to do most of the talk to activate their listening, since listening skills require practice and exposure.

Some researchers observe that not enough time is given to various exercises and opportunities for the improvement of listening ability. Pupils often complain of ignoring, and discouraging by their teachers for not listening correctly. Although both teachers and pupils are responsible for the poor listening ability of the latter, the teachers, who have the professional knowledge and skills, bear a greater responsibility.

Listening comprehension is a key initial step in communication. The better a student can understand what is being said, the better will be their ability to communicate. In addition, they will be better able to notice the characteristics of the target language which will help improve their language development in all four key skill areas.

Pupils may feel a great deal of pride when they are able to comprehend something in the target language. This can be a great motivating factor in continuing to learn the language, and teachers should do whatever possible to promote this sense of accomplishment. Consequently, teachers need to construct learning activities which will enhance learners' comprehension (listening skills) and motivate them, as well.

The work of Cohen (1988) is a great help in this area. They outline a series of questions which teachers need to consider when preparing listening activities:

•   What is the context for listening?
•   Should one or two items from the listening exercises be modeled for the whole class so that learners know what to do?
•   How many times should the item be heard by pupils?
•   How will learners check the accuracy of their listening? (that is, the pupils' answers?)
•   Is it possible to check listening accuracy to be done independently or collaboratively?

An effective teacher is aware that pupils are not always able to develop oral comprehension skills on their own; without additional supports listening, by itself, is not enough to develop better listening skills. Here are several activities a teacher can employ to facilitate the development of listening skills.

•   Promote active listening: Giving the pupils something to listen for ensures that they are involved in the task. Exercise sheets are another tool that promote active listening;
•   Identify listening strategies: Give the pupils tools to guide their listening; such as, looking for specific information, identifying predictable words or phrases, or discussing what they expect in certain forms of speech; such as, newscasts or advertisements.;
•   Selecting the most appropriate strategy for presenting the lesson; for example, using a top down (general meaning, summarizing) or bottom up (specific words, word order patterns) approach;
•   Allow the pupils to hear as much of the target language as possible while using a variety of teaching methods; for example, sometimes using visual cues, at other times not;
•   Use authentic materials; for example, a lecture or a radio announcement in the target language, to help pupils become accustomed to different accents and to a realistic pace of speech;
•   Ensure the pupils know the goals of the listening task: is the goal to understand what's being said, to decide whether to keep listening or to obtain specific information?
•   Provide opportunities for reflection and discussion so the pupils can share what was heard, what was learned and methods they employed to better understand what was said;
•   Organize pre-listening activities, such as providing pupils with relevant vocabulary, reading a related text, looking at a related image or clarifying necessary cultural information etc.;

•   Be sure to check level of the listening exercise beforehand to ensure it is an appropriate level for the pupils.

As Gregory L. Rynders, who held a research in developing listening skills in 1999, mentioned, cooperative learning in listening is defined in terms of its purpose for using various learning activities that accommodate pupils' different learning styles to enhance their participation and understanding of the topic by creating an atmosphere of achievement. This is accomplished through cooperative efforts for mutual benefit from each student. It also promotes and enhances pupils' self-worth and communication skills which leads to academic achievement and interpersonal skills.[4]

In developing listening skills, one of the most important aspect is motivation. Listening skills are an essential aspect of the development of motivation which empowers pupils to develop their communication and critical thinking skills necessary for functioning competently in the ESL classroom, the workplace, the home and other places where language learners engage with the public. The development of active listening is essential to pupils' ability to negotiate language outside of the classroom.

Interactive listening skills also improve learners' interpersonal skills, which enable them to establish a healthy relationship with their conversation partners. Despite the necessity of effective listening skills in any form of relationship, it is crucial to note that people can learn how to become good listeners since it is not an innate skill.

The ability to listen well improves in conversation with friends, families, colleagues, teachers and acquaintances. These skills can be developed at home, at school and in the workplace by asking clarifying questions during the whole class discussion at school among others. It is the process that lead to a comprehensive and constructive learning.

In consideration of the above-mentioned data about interactive listening and motivation of ESL pupils' participation in language learning, it is quite clear that interactive listening is imperative in daily life as more time is spent listening to each other in order to respond appropriately in an overall language learning as compared to other learning skills (Morley, 1991).

4 Acknowledgment

In the ESL classroom, it is easy to see that interactive listening plays a significant role in enhancing ESL pupils' comprehensible input and advancement of ESL learning when teachers create lesson plans that encourage pupils to connect the content to their own lives through listening because they are then able to learn on their own. For these reasons, this research contributes to a better understanding of the perceived ESL pupils' motivation and the strategies used by ESL teachers.

Firstly, concerning the promotion of engagement in ESL learning, the study seeks to offer a comprehensive overview of student motivation for learning ESL, which increases when the classroom activities provide them with opportunities for independent or expanded learning outside the classroom with peers or they are related to their future goals outside the classroom. For example, Cohen (1988) stated that "the quality of experience of people who play with and transform the opportunities in their surroundings is clearly more developed as well as more enjoyable". When pupils see connection between classroom activities and real life situations, they are able to expand and enhance their understanding. In other words, the goal is to create active learning experiences and to ensure relevance in the curriculum.

Listening in a LS environment is different from listening in a content class conducted in the mother-tongue and from listening comprehension tasks in the language class. It is very important to teach pupils how to listen. In this light, listening emerges first and foremost as a process and second as a product. Consequently learners become responsible for their own learning and gain control over the listening process. Listening skills can be developed by the instruction of general learning strategies.

Evelyn Pitre (2007) distinguishes three types of listening: content listening, critical listening and emphatic listening. According to his idea, the skills involved in content listening are threefold: identifying the key points; asking clarification questions and verifying content. For critical listening one needs to be able to listen for and test the content; evaluate the logic of the argument, the strength of the evidence, the validity of the conclusions, the implication of the message, the agenda of the speaker, etc. Empathic listening involves the following skills: ability to ask open questions; keep the speaker going; reflect on the content.

Among the basic principles of effective listening, emphasized by Cohen (1988), one could mention the importance of active attention. Listening involves mental activity, including cognitive and affective processing of received information. Consequently, educators enhance listening competence through diligent focus on the mental processes and skills involved in perceptive listening, such as memory, sense making, and evaluation. Listening is a variable communication activity that differs according to the purpose and nature of the listener and the speaker, the content and style of the message, the channel of communication, and the surrounding environment.

Listeners use metacognitive, cognitive, and socio-affective strategies to facilitate comprehension and to make their learning more effective. Metacognitive strategies (e.g. planning, note-taking, transfer, resourcing, self-monitoring, evaluation, selective attention, directed attention and parsing) are important because they oversee, regulate or direct the language learning process. Cognitive strategies (e.g. elaboration, inferencing, imagery, summarization, contextualization, grouping, repetition, problem identification, hypothesis testing, translation and predicting) manipulate the material to be learned or apply a specific technique to a listening task. Socio-affective (e.g. reprise, feedback, uptaking, clarifying, affective control) strategies describe the techniques listeners use to collaborate with others, to verify understanding or to lower anxiety.

As Cohen (1988) notes, one of the difficulties in strategy instruction is the nature of the skill of listening: it is ephemeral and non-visible, which is likely to affect pupils" low assessments of their listening skills and consequently to low motivation and poor success in foreign-language listening comprehension. The results of strategy instruction are controversial, but there is some evidence that consistent, long-term strategy instruction is able to improve learners" strategic activity and lead to better learning outcomes.

Developing good listening skills is an inherent part of the whole learning process. It cannot be taken apart and analyzed as a separate skill without the general context or any other educational methodology. Pupils develop better oral communication skills, they improve listening skills, they also develop reading skills and academic writing, as well as acquire the skills of presentation and develop ability to answer spontaneously to questions. Thus they definitely improve both subject and foreign language competence.

It should be said that listening competence is a complex skill that needs to be developed by practice. Teachers should provide their learners with opportunities to reflect on their listening processes and practices. The role of the teacher is very important, as the teacher not only guides the pupils through the process of listening, but also motivates them and puts them in control of their learning.

The importance of finding effective strategies for teaching listening was demonstrated in research done by Hasan (2000), Kim (2002) and Graham (2003, cited by Vandergrift (2007), who concluded that language learners perceive listening as the most challenging skill to be developed. The grade of difficulty in understanding specific listening input in L2 may generate in learners a feeling of frustration and anxiety.

B)Importance of Developing Listening Skills

Listening is probably the most important skill that people need to develop to acquire a second language since it is the principal means by which learners receive linguistic input. However, it is found that this skill presents the highest level of difficulty in teaching English as a foreign language to elementary grades. Rubin (1994), Dunkel (1991), Rost (1990) and Anderson and Lynch (1988) emphasize that listening skills play a crucial role in communication. Moreover, Oxford (1993) says that "listening is perhaps the most fundamental language skill". Richards (1983) cited by Brown (1994), who mentions a list with some micro skills useful for learners to acquire effective interactive listening strategies. Some of these micro-skills were taken as criteria to develop listening in this project: Retain chunks of language of different length in short- term memory, discriminating among the distinctive sounds of English, recognizing reduced forms of words.[5]

Listening is the process of receiving attending and assigning meaning to aural stimuli. That is, listening is the very first step for us to receive stimuli and then make responses to the external communication can also be regarded as a problem-solving skill, whereas listeners are the problem solvers trying to analyze and decipher a series of signals from the coming message.

It's a highly integrative skill playing an important role in the process of language acquisition and facilitating the emergence of other language skills. Listening, as Cohen (1988) stated, is taking in information from speakers, acknowledging the speakers in a way that invites the communication to continue, providing limited, but encouraging input to the talker's response and carrying the person's ideas one step forward. Furthermore, the phonological system of the reading and writing combined.

Language is acquired by listening and oral communication is impossible without a listening skill that is much more highly developed than the speaking skill serve as the basis for the development of speaking Additionally, listening involves the interactive process of speaking and listening, and plays a critical role for both an individual to be able to continue the discourse and a medium in the communication process.

It can also stressed that the key to achieving proficiency in speaking is the development of proficiency in listening comprehension. Moreover, Rivers (1984) demonstrated that adults spend 40-50% of communication time listening, 25-30% speaking, 11-16% reading and about 9% writing. In other words, an adult spends more time on listening. However, according to listening in communication than on the other three skills. It's surprising that on the average, people are only about 25 percent effective as listeners. Mueller (1980) indicated that listening is the least understood of the four language skills and consequently the least well taught. Listening is frequently viewed, as it

was claimed, as "an enabling skill, not worthy of attention on its own". This concept leads people to believe effective listening is instinctive and listeners will automatically understand spoken messages without specific exercises and practice in this skill.

As a result, people make little effort to learn or develop listening skills and unknowingly neglect a vital communication function. In response to the mistaken assumptions, this researcher strongly recommends that the teacher teaches listening comprehension strategies and always integrate listening activities into a language program.

Although the ultimate goal of foreign language pedagogy places stress on the development of four language skills, in comparison with other three language skills, listening has long been the most ignored skill in language teaching. In today's language classroom, many teachers and learners view speaking as their priority and mistakenly believe that the most useful method to acquire communicative fluency is to increase the opportunity to "talk" rather than to "listen". The significance and influence of listening have not received priority yet. Reason is individuals' neglect of the role of the listening skill.

First, some people are convinced that listening skills can be acquired automatically and learned in real-life settings (Braxton, 1999). This mistaken notion, long rooted in people's mind, reflects the partial reason why language educators and learners don't regard listening teaching and learning as an important skill in the classroom.

The importance of Extensive Listening is obvious in language learning L2 indicates that a large amount of exposure to input, whether visual or aural, is vital for language acquisition. This suggestion seems to be supported by researchers stressing the importance of quality input in language acquisition.

Cohen (1988) argues that humans acquire listening skills and language by understanding language that contains structures slightly beyond their current level of competence: comprehensible input. He suggests that it is important for the learner to listen to a large amount of spoken English that is relatively easy. Easiness, in his opinion, is another key factor that helps the learner improve listening skills and language. Easiness and interest may be factors that determine whether the learner is actively involved in listening, or not.

Motivation is considered main determinant of second/foreign language (L2) learning achievement. In the last thirty years, there had been considerable amount of research done that explores on the nature and role of motivation in the L2 learning process.

When a student shows little interest in some lecture, this attitude is referred as a lack of motivation. When the problem is seen more deeply, we realize that the student's lack of motivation is due to several factors. It is now acknowledged that teachers' teaching style affects to a large extent pupils' interest and motivation. Although the self-determination theory has concentrated its investigation on children and adolescents, the researcher considers that the support/control is best illustrated at the university level. It seems more reasonable to discuss this issue at the university since pupils who are young adults understand it and respond to it better.

In the investigation of motivation, one often wonders about the role played by such driving force in learning and achievement. It is certainly not always easy to set the effects of motivation on learning. However, most pupils who seem to display a low motivation towards their studies need to be shown how to enjoy their studies more, and mainly how their teachers can enhance their motivation by means of some motivational strategies.

As a matter of fact, people may be motivated towards a certain number of things and may not be motivated towards others. The same person can feel interest in and enjoyment for certain things and at the same time a lack of interest towards others.

Motivation is an important factor in learning a second and foreign language. It is defined as the individual's attitudes, desires, and effort define motivation as concerning energy, direction, persistence and equality-all aspects of activation and intention [6].

Regarding motivation, the main findings of this study indicate that the use of student questions to promote communication from diverse perspectives, taking into consideration student's interests, teacher's teaching style are significant motivational tools.

C)Background of extrinsic motivation and instrumental motivation in an ESL classroom

Extrinsic motivation is perceived to attribute to pupils' educational results under their own control (interested in mastering an ESL topic) while instrumental motivation focuses mainly on the practical and functional use of ESL. Extrinsic motivation and instrumental motivation have been regarded as important factors in ESL achievement because pupils expand their efforts to learn ESL and achieve their goals. For example, international pupils residing in the United States of America may learn English for academic purposes as well as for the purpose of integrating with the people and culture of the country. For that, extrinsic and instrumental motivation are essential for the successful acquisition of ESL. Thus, pupils are motivated because of the exigencies of having to learn a language for a variety of purposes.

ESL information generated both from observations and communications with other pupils. Interactive listeners complete critical thinking activities by clarifying their viewpoints with accurate and rational knowledge to demonstrate their understanding of the topic at hand.

This has direct pedagogical implications. For example, teachers could foster imagination by crafting writing assignments where pupils write about TV shows, movies and discussion questions to stimulate student thought. Also, choosing media with a connection to the unit topic serves as an integral part of the teaching unit, as simulations and games motivate pupils in unique ways. For the purpose of using critical thinking for real-life communication, teachers could establish a classroom environment which provokes pupils' critical thinking and forces them to ask questions about method and evidence (Pearce, Johnson, & Barker, 1995).

For example, pupils should be able to ask "what are the arguments based on?" in order to analyze supporting evidence. This notion of language learning and acquisition could be successful in an intensive oral interaction in ESL when employing questions as a way of presenting and eliciting language. Therefore, interactive listening deals explicitly with ESL acquisition and, implicitly, with ESL learning. This means that pupils need chances to say what they think or feel and to experiment with using language they have heard or seen in a supportive atmosphere, without feeling threatened in order for language learning to take care of itself.

D)ESL Learning Strategies in Listening: According to Cohen, learning strategies refer to pupils' behaviors and techniques they adopt in their effort to learn a second language which is influenced by their motivation, cognitive style, and personality, as well as by specific contexts of use and opportunities for learning.

E)Learner autonomy in Listening: In interactive listening, pupils' motivation increases whenever they are given opportunities to take initiative in their learning which eventually boosts their confidence and abilities to learn ESL more effectively. Therefore, giving pupils opportunities to engage in a class discussion, to ask questions and to constructively argue their viewpoints based on questions raised by classmates becomes beneficial for their vocabulary acquisition [7].

This view suggests that class discussions are crucial resources of ESL learning because they involve listening as well as speaking. Therefore, ESL scholars should be more considerate of the richness of class discussions in their research. This means that ESL teaching and learning ought to be geared towards the development of attentive listening. Pupils need to have varied opportunities in which they could choose the activity that best fits their interests and their style of learning, and increased use of autonomy-supportive behaviors so that all pupils have an opportunity to become involved in a way that is most comfortable for them.

F)Barriers to Effective Listening: Motivation and attitude is the greatest deterrent to effective listening. We hear what we want to hear and we don't hear what we don't want to hear. Without the proper attitude or motivation there is no possible way we will hear, let alone comprehend what the other person is communicating.

As Cohen suggests, many people are ineffective listeners because of a lack of concentration and attention. One of the greatest deterrents to concentration and attention is the mistaken assumption that we can do two things at the same time. The classic example is the person who believes that we can read and listen at the same time. Naturally, nothing is further from the truth. Outside distractions such as phone calls, nearby conversations and people walking by can all easily distract us. It is important to realize that to listen effectively we need to concentrate and ignore distractions. Many people possess negative attitudes toward listening. To them, listening is a passive, compliant act. This is usually considered to be the most obstinate barrier to effective listening. The reason for this is that we are taught to believe that listening is a passive act. Something that other people do, but not ourselves. We believe that talk is power; when we have "the floor" we are in control. Ironically, the reverse is the truth. True power is in listening. When we truly listen to others, they tell us how to best approach them in meeting their needs.

Experience and background have a great bearing on how good a listener we are. As an example, in order to understand speakers with good vocabularies we must also have a similar vocabulary. If we don't, we can either ask the speaker to explain the point or tune them out. Unfortunately, many take the later course.

Where we choose to communicate, that is the listening setting, has a great bearing on how effectively we listen. If we are trying to listen near sources of external distractions, our attention and concentration will be severely challenged. Another ingredient in a positive setting is allowing for an appropriate "personal space". If we are too close to the speaker, it will violate the listener's space. Finally, the environment is important. If it is too hot, cold or another affecting quality, the surroundings will distract from the speakers message. Many ineffective listeners use their emotions to classify or prejudge the speaker. This tends to distort the message positively or negatively. They prejudge the speaker solely on their image. The speaker can be classified as "one of us" or "one of them." Our beliefs and values also determine how well and how objectively we listen to the message content. When we

became too emotionally involved with the content of the message or the speaker, we will systematically distort the message. Day dreaming and fantasizing are perceived by many psychologists and psychiatrists to be a healthy aspect of life. However if we can't control how often and when we do it, it can be extremely detrimental to our listening effectiveness and to our emotional health. As was noted earlier, the reason for daydreaming and fantasizing during the listening process is the fact that people think nearly four times as fast as they can speak. This disparity is used by the skilled listener to their advantage and as an opportunity to let the ineffective listener's mind wander. Certain speakers have a much easier delivery than others. Listeners feel more comfortable when the speakers pace is compatible with theirs. There is a potential for obvious listening problems among people of different delivery styles and listening preferences. A standard response for speaker - listener incompatibility is for the listener to "tune out" the speaker or distort the message. The listener however, can train to increase attention and concentration when confronted with these styles. Finally, Hunsaker and Alessandra suggest that one of the simplest barriers to overcome, but most ignored, is the lack of learned listening skills. Awareness and knowledge of the previously noted barriers as well as the motivation to overcome them. They report that above all, however, the most effective way to overcome the lack of listening skills is to increase motivation to become a better listener [8].

They hypothesize that when people are free to choose to perform an activity, they will seek interesting situations where they can rise to the challenges that the activity presents. By striving to meet these challenges, learners develop a sense of competence in their abilities.

Cohen (1988) says that no single phenomenon reflects the positive potential of human nature as much as extrinsic motivation, which is defined as the inherent tendency to seek out novelty and challenges, to extend and exercise one's capacities, to explore, and to learn. Developmentalists acknowledge that from time of birth, children, in their earliest and healthiest states, are active, inquisitive, curious, and playful, even in the absence of rewards. The whole construct of motivation describes this natural inclination toward assimilation, mastery, spontaneous interest, and exploration that is so essential to cognitive and social development and that represents a principal source of enjoyment throughout life.

Self-determination approach to motivation refers to motivation to perform an activity simply for the pleasure and satisfaction that accompany the action. These feelings of pleasure are derived from fulfilling innate needs for competence and self-determination.

G) Motivation and Learning Strategies: Bacon and Finnemann (1990) investigated the relationship between attitudes, motives, and strategies of university foreign language pupils. The results revealed that motivation played a role in the choice of strategies. Pupils who were not instrumentally motivated used more global/ synthetic strategies, but avoided the use of decoding/analytic comprehension strategies.

Oxford and Ehrman (1995) examined the relationship between language learning strategies and factors such as proficiency, teacher's perception, gender, aptitude, learning style, personality type, ego boundaries, motivation and anxiety. They found a significant correlation between learning strategies and total motivation.

A significant correlation was also found between strategies and intrinsic motivation. The use of metacognitive strategies was positively correlated with intrinsic motivation. Braten and Olaussen investigated the relationship between motivational beliefs and use of learning strategy among Norwegian learners. It was found that when pupils perceive intelligence as a relatively important quality, they tend to use more learning strategies.

Vandergrift (2005) examined the relationships among motivation, metacognition, and proficiency in listening comprehension. Participants were 57 adolescent learners of French who completed two questionnaires. A motivation questionnaire assessed student responses to three orientations related to motivation:, intrinsic, and extrinsic. A metacognitive awareness questionnaire assessed the metacognitive strategies used by pupils when listening to authentic texts in French. Most strategies correlated negatively with motivation. A significant correlation was found between intrinsic motivation, extrinsic motivation, and use of strategies, but there were more significant relationships between these listening strategies and intrinsic motivation than in the case of extrinsic motivation. Without a doubt, there are still so many things to be done when it comes to conducting research on motivation. In the end, the voluminous amount that might come from studies related to the said topic would further enhance how teachers practice their profession and how pupils acquire and process knowledge in general.[9]

5 Disscussion

What is the role of comprehension in developing the listening skills of the pupils? Comprehension plays a great role in raising listening skills of the pupils. It is an invisible power which pushes them to learn more, and it leads to accomplishment of their set goals. While reading feedbacks of the pupils about those conducted 6 lessons, the researcher discovered that there is really huge effect of motivation and it reflected in their opinions. The effect can be seen in the result of this investigation.

How significant is the function of topics to push the pupils to interested in to improve their listening skills? Topics do the function of obtaining positive or negative consequences of targeted learning task. If the topic attracts the attention of the learner, it means that almost 20 % of motivation is given to him/her. It is obvious that a person learns the thing with a great interest if the topic magnetizes the attention of the pupil.

Is there correlation between interested topic and the result in obtaining developed listening skills? Interested topics have influence to develop listening skills of the pupils. If they listen to the tracks, watch videos, listen to the songs or participate in the trainings which are in the theme interesting for them, then the results will be as high as they are expected. All in all, the researcher came to the conclusion that comprehension plays a significant role in developing listening skills of the pupils.

6 Conclusion

The journey of writing and conducting this study has been stimulating, challenging, and most of all very and fulfilling and informative. The researcher identified that the function of comprehension in developing pupils' listening skills is noticeably enormous because this unseen strength pushes them to discover new high peaks of knowledge world. It is recognized by the researcher while conducting the investigation that not only extrinsic motivation guarantees comprehension to have raised skills of the pupils, but also they should have intrinsic type of motivation, strong wish and set goal to enhance on their listening skills. Extrinsic motivation may build the firm foundation to all next processes in comprehension. As far as the researcher is concerned, types of topics and rate of their interesting, average interesting and uninteresting have major influence to attract the attention of the pupils to work on their listening skills. Interest and desire of the pupils towards doing the listening task comes into being automatically if the topic is intriguing, comprehensive and universal. The researcher faced some drawbacks while holding the research:

- There is still an understanding or fear in some pupils' mind that they are not able to develop their listening skills and it is really challenging to motivate them to do this and to persuade them that they can improve it;
- Listening lessons should be paid more attention and it requires more practice;
- Range of topics for Listening lessons should be chosen appropriately according to the interest and level of the pupils.

All points considered, the researcher suggests this study to be used beneficially by teachers or other researchers in the forthcoming future. The researcher has put the aim of continuing investigating this very issue more broadly and completing it perfectly in the next process of her studying.

On the whole, conducting this study was a wonderful, innovative and inspiring experience.

References

[1] Cohen, J. (1988). Statistical Power Analysis for the Behavioral Sciences (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates,

[2] Morley, Joan (*1991*). "The Pronunciation Component in Teaching English to Speakers of Other Languages."

[3] Wolvin, A.D., & Coakley, C.G. (1996). Listening (5th ed). Dubuque, IA: Brown and Benchmark.

[4] Gregory L. Rynders (1999) Listening and Leadership : AStudy On Their Relationship Executive Leadershiphttp://www.usfa.fema.gov/pdf/efop/efo29219.

[5] JackC.Richards Listening Comprehension: Approach, Design, Procedure First published: June 1983

[6] Deci, E. L., & Ryan, R.M. (1985). Intrinsic Motivation and Self Determination in Human Behavior. New York: Plenum Press.

[7] Baumfield, V., & Mroz, M. (2002). Investigating pupils' questions in the primary classroom. Educational Research, 44(2), 129-140.

[8] Hunsaker, P., &Allessandra, A., (1986). The Art of Managing People.New York: Simon & Schuster Inc.

[9] Vandergrift,L/ 2005 'Relationships among Motivation Orientations, Metacognitive Awareness and Proficiency in L2 Listening', Applied Linguistics 26: 70-89.

[10] Muira.X. Applying authentic materials in teaching listening.2018/12/29.Monographs on pedagogy.Vol.18/1 str.18-27.

[11] Khakimova.Munira Key factors affecting language acquisition development of EFL learners.(2019/4) Jurnal "Nauka I obrazovaniya"Vol.53№7 str.141-144.izdatel.Moskva-2019.

The element of digital technologies : mobile application , scientific progress development impact and effect

Dilnoza Pazilova orcid : 0009-0007-5389-705X

e-mail: pazilovadilnoza1014@gmail.com

University of Tashkent for Applied Sciences, Tashkent,100000,Uzbekistan

Abstract : This scientific article uses a mobile application as an element of digital technologies. In this article, a simple and understandable method of creating a program based on the visual programming method and an example of an assessment method via messengers is presented. The results of this method can be seen in the form of a statistical analysis in the form of a diagram.

Keywords : messenger,motivation ,visual programming method , interactive , individual , diversification, gamification.

1 Introduction

With the development of digital technologies , in particular, mobile applications play an important role in the modern educational process. Mobile applications create new opportunities in the field of education and help make the process of acquiring knowledge more effective and interesting for students. Diversification of teaching and learning methods, as well as the ability to meet the individual needs of students, require the use of mobile applications in education. Mobile applications, in addition to influencing the development of science, turn the educational process into an interactive and convenient environment for learning. They provide students with the opportunity to consolidate their knowledge, assimilate new information and self-assessment. At the same time, mobile applications serve as a convenient tool for teachers to plan lessons, monitor and assess student progress. Knowledge and skills acquired through mobile applications in education serve as a solid foundation for students' future scientific activities. Mobile applications , as well as teaching methods innovative in a way to update help They give students certain topics study in the process interactive elements add through mastery level to increase service For example , the game using elements (gamification) education process interesting and attraction doer to do It is possible . It is yours . In turn , the students motivation increases and knowledge to take was their interests Also , mobile applications education to resources to enter makes it easier . Students and teachers desired at any time , at any time in place necessary to the information has to be to the possibility has Students own their time effective management to the possibility has to be , to be knowledge reinforcement and expansion for additional from materials uses possible .

Mobile applications also help students social interactivity to increase help gives . Students each other with idea exchange , problems together solution to do and mutual help to give to the possibility has They will be . This is their own in turn , collective work skills to develop service does this and modern work in the market very important . Of these all mobile applications through education process efficiency increase , individual needs of students satisfy and to the development of science positive impact show for important are factors . Therefore , mobile applications education in the field strategic accordingly application necessary , because they not only knowledge to take process makes it easier , but students in the future successful activity to conduct prepares .

2 Materials to take technology and research method

This pilot test, in which an innovative method of using mobile applications (telegram bots) and social media networks was used in the teaching of one of the specialized subjects in higher education institutions,

"Introduction to Web Programming", was conducted with the group of KI2201S07A students of the correspondence course, one of the subjects under the Department of Computer Engineering, Faculty of Information Technologies, Tashkent University of Applied Sciences. An example of an innovative teaching method is given below:

Visual Programming Method : Visual programming tools allow students to develop algorithmic skills based on basic knowledge.

Using the visual programming method sample

Topic : Working with strings, arrays, and files in PHP

 Lesson Objective :

1. Developing Algorithmic Thinking: Using visual programming tools to develop students' understanding of algorithms.

2. Motivation: Increasing students' motivation to learn programming, using social media interfaces.

3. Practical Skills: Learn how to work with strings, arrays, and files in PHP.

Required resources:

- Visual Programming Tool: A platform that supports visual programming for PHP (e.g. Scratch, Blockly, or a dedicated web interface).

show the visual programming interface and examples .

- Computers: One per student or group, with access to a PHP development environment.

Lesson Structure

1. Organizational structure (10 minutes)

- A brief explanation of how visual programming helps you understand complex concepts.

- A discussion about the importance of PHP in web programming and how it can be used on social media platforms.

2. Theoretical part: Demonstration of Visual Programming (20 minutes)

Show students how to create simple PHP scripts using a visual programming tool :

```php
$firstName = "Ali";
$lastName = "Valiyev";
$fullName = $firstName . " " . $lastName; // "Ali Valiyev"
```

- String manipulation: concatenation, length determination, and substring replacement :

```php
$string = "Salom, Dunyo!";
$length = strlen($string); // 14
```

Substrings Substring Replacement:
• Inline known one part change for From the str_replace ( ) function we use :

```php
$originalString = "Men O'zbekistonlikman.";
$newString = str_replace("O'zbekiston", "Qozoqiston", $originalString);
```

Show array operations : create, access , and modify arrays :

```php
$fruits = array("Olma", "Banan", "Apelsin");
```

Accessing Array Elements :

- Array to the elements indexes through entrance possible .

```php
$firstFruit = $fruits[0]; // "Olma"
```

The array Modifying Array Elements :

- Array elements change for index we use .

```php
$fruits[1] = "Qulupnay"; // Massiv endi: ["Olma", "Qulupnay", "Apelsin"]
```

3. Creating a Simple PHP Script (30 minutes)

Tasks for the group :

- Create a visual program that accepts a string and an array entered by the user.

- Perform operations such as finding the length of a string, reversing it, and sorting an array.

- Display results in a social media interface.

5. In this lesson, students were introduced to the basic principles of working with strings and arrays in the PHP programming language. We covered string manipulation operations such as concatenation, length determination, and substring replacement, as well as the processes of creating, accessing, and modifying arrays. These skills will make it easier for students to understand and apply the programming process, and will also help develop algorithmic thinking.

One of the important aspects of the final part of the lesson is to activate the students. The teacher can ask open-ended questions to encourage questioning and discussion, for example:

- "What do you think is the importance of string manipulation in programming?"

- "In what situations can you use arrays?"

- "In your opinion, what are the advantages of the PHP programming language?"

Such questions allow students to discuss and apply what they have learned.

Discussing how the skills learned in class can be applied to real-world projects, especially those related to social media platforms, encourages students to put what they have learned into practice.

1. Creating content for social media:

- Students can use their PHP skills to create applications to manage posts on social media platforms or to interact with users. For example, using arrays to store and display comments submitted by users.

2. Data analysis:

- PHP allows you to create programs to analyze social media data using strings and arrays. For example, analyze user comments to determine which posts are generating the most interest.

3. Interactive web applications:

- Students can use PHP to create social media interfaces and use arrays and files to manage user data. This will allow them to improve their programming skills and solve real-world problems.

This hands-on experience provides students with new opportunities to apply their skills in practical projects, stimulating their interest and motivation in the programming process.

Rating:

- Group Presentations: Each group presents their visual program and provides a logical explanation of their code.

This course design integrates visual programming to make learning PHP fun and practical, encouraging students to apply their skills in real-world settings.

3 Results of experiments conducted at University of Tashkent for Applied Sciences

Table 1

|	Indicator	Experiment groups				Control groups			
		Experience at the beginning student number	%	Experience at the end student number	%	Experience at the beginning student number	%	Experience at the end student number	%
Tashkent practical sciences university	Excellent	42	16 , 9	48	29.6	13	17.6	14	18.9
	Good	43	30 .9	48	59.1	24	3 2 , 4	25	33.8
	Satisfactory	25	36 , 7	37	11.3	29	39 , 2	31	41.9
	Unsatisfactory	11	15.5	0	0.0	8	1 0 , 8	4	5.4
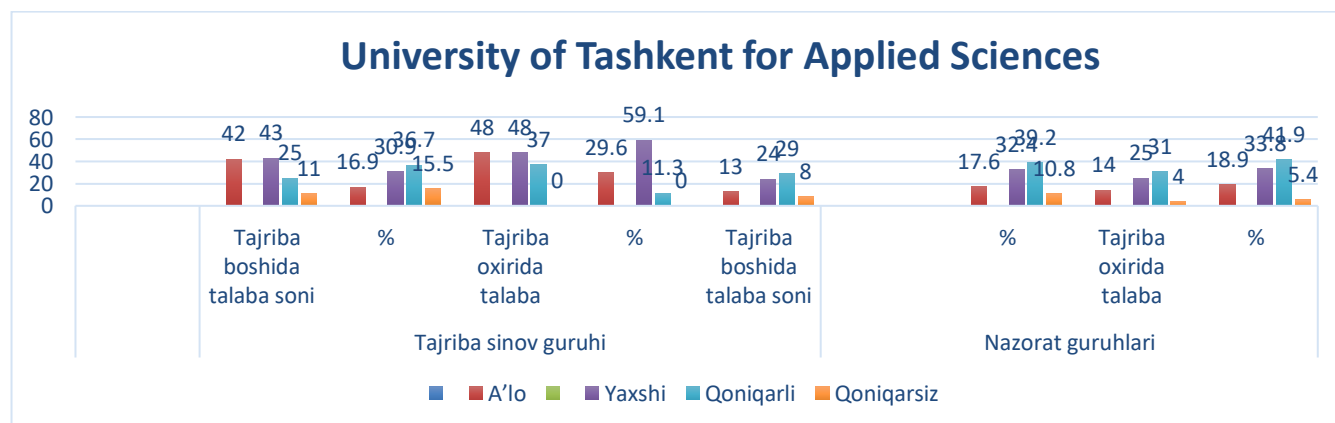
Figure 1. Diagram of the results of the experimental tests conducted at the Tashkent University of Applied Sciences

4 Conclusion

In an era of rapid development of digital technologies, the importance of educational tools is high: the use of mobile application-based systems in the implementation of tasks allocated for independent learning in the subject of introduction to web programming provides effective approaches to involving students in practical programming, forming project instructions through the creation of small programs. This develops students' practical skills and leads to the strengthening of their independent thinking and creative approaches in the field of information technology.

Based on the emerging trend in the development of computer and information and communication technologies, the organizational and technological conditions for teaching general professional subjects in higher education institutions, and the study of educational regulatory requirements for the mastery of general professional subjects, the following number of contradictions were identified in higher education institutions related to the need for students to master modern technologies:

One of the main goals of the program, created for the social network Telegram (messenger), is to create great opportunities for improving modern educational technologies based on scientific views on student assessment. The results of the experimental tests obtained will contribute to the improvement of science and the development of innovative pedagogical and technological skills of teachers, as well as the development of students' information literacy skills.

Reference

1. Dildora Saparbekova. "Maqa." *Academia.edu* , 12 Oct. 2023, ww.academia.edu/108025354/Maqa. Accessed 16 Nov. 2024.]
2. Dilnoza Kurbonova . " Pedagogy 1." *Academia.edu* , 10 Jan. 2024, www.academia.edu/113270152/Pedagogika_1. Accessed 16 Nov. 2024 .
3. educational process To'xtayeva Fazilat Shavkat qizi, 2 Education and innovative research 2022 y. №7 https://doi.org/10.53885/edinres.2022.7.7.027-131-134 p.
4. Sattarov AR Organization of the independent work of students of higher education using the web-quest method. // International Journal on Integrated Education. 2021, January, Volume 4, Issue I. 67-71 p.
5. Sattarov AR Using the mobile polling and voting method in the course "web design". // International scientific and practical online conference. Integration into the world and connection of sciences. January 2021, Baku, Azerbaijan Republic, p. 125-129.
6. Mbandje , Daniel & Loureiro, Maria João & Lucas, Margarida. (2024). Digital competence and information literacy: clarifying concepts based on a literature review. Educational Media International. 60. 1-11. 10.1080/09523987.2023.2324584
7. *https://learningportal.iiep.unesco.org*

Modern Problems and Solutions of Science and Innovative technologies

Asadullayeva Nargiza iD orcid : 0000-0001-5855-1698
e-mail: nargizamatem@gmail.com

University of Tashkent for Applied Sciences , Tashkent, 100149, Uzbekistan

Abstract : The rapid development of science and innovative technologies has a positive impact on all aspects of society, but this process also creates a number of modern problems. This work considers such pressing issues as environmental protection, ethical issues in the use of artificial intelligence, and the social consequences of genetic engineering. At the same time, effective solutions are analyzed, such as the use of renewable energy sources, the creation of fair regulatory systems, and the use of interdisciplinary approaches. The study emphasizes the importance of global cooperation and the need to increase technological literacy, and also shows ways to reduce risks so that innovations serve the benefit of humanity.

Key words : Artificial intelligence , genetics research , global , environmental , information safety strategies
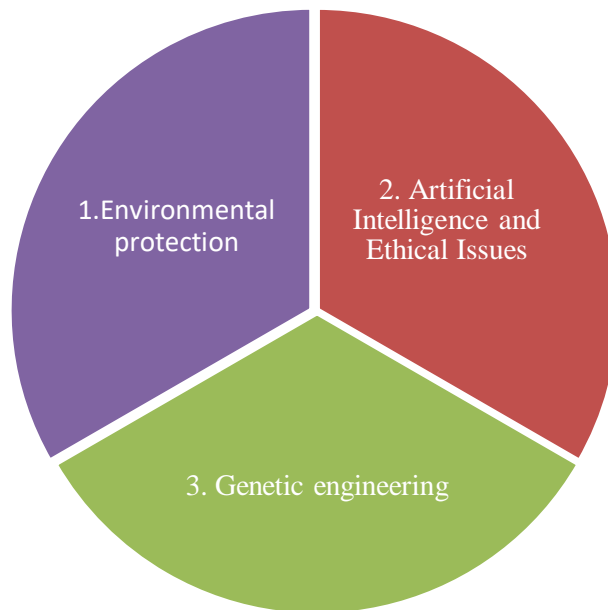
1 Introduction

Science and innovative technologies have reached a stage of development unprecedented in the history of mankind. Today, technologies have a positive impact on all aspects of society. However, this process is not without problems. This article discusses the problems associated with modern technological development and their possible solutions.

2 Modern problem research method of science and innovative technologies

Global trends in modern education. Globalization of education, the process of economic, political, cultural integration and unification of education throughout the world in recent decades, its expansion. The internationalization of education beyond the borders of national education systems and the formation of a single educational space and market for educational services. Popularization of education. Democratization of education. Educational technology. The age-old importance of education in the development of human capital as a key factor of economic growth. Continuous and life during education to get . Talents for of competition intensification . The world leader universities strategic development main directions. In Uzbekistan science develop on the way problems and science and scientific activity of the field main directions .

Technological development is causing global environmental problems, including climate change, resource depletion, and increased waste. Production release processes and energy sources pollution level reduce necessary .

Artificial of artificial intelligence (AI) technologies wide application moral and legal problems For example , SI decisions acceptance in doing human rights non-destructive need . That's why for moral norms formation and order to put mechanisms working exit important .

Genetic research health in storage new opportunities created although , genetic engineering humanity future for danger to give birth possible . These technologies social and moral impact meticulousness with to be studied necessary .

3 Solutions of modern problems in science and innovative technologies

Science and innovative technologies in the field development of life various to the fields positive impact shows . However, this changes serious also causing problems is releasing . Below modern problems and their solutions analysis will be done .

Again recovering energy Sources : Sun , wind , and bioenergy such as energy from sources use expand . Waste again work Technologies : Innovative waste management systems current to do ." Green technologies Development : Ecological clean products working to release encouragement .

Artificial intellect in the field international legal mechanisms working exit and moral norms current to do. Worker of strength new to technologies adaptation for again preparation courses organization Transparency Increase : Artificial intellect decisions transparent and understandable to be to provide .

International biotechnology Rules : Genetic engineering control to do at a global level for standards Create . Biotechnologies to practice from entering before far term consequences carefully study .

The public aware to do : Genetic changes and their consequences about wide information to give

Technological literacy Education : in systems modern technologies to understand related courses current

Information safety Strategies : Cyber threats reduce for new security systems create

Stable Infrastructure : Technological infrastructure everyone for equal use opportunity to provide .

Digital the economy Development : Innovation all social layers for benefit to bring to provide .

Global cooperation Development : Technologies stable to develop redirect for interstate cooperation strengthen .

Small business Encouragement : Innovative startups support .

4 Conclusion

Science and of technologies development of humanity many problems solution to do possible . But this process caution and requires responsibility . The environment protection to do , social inequality reduce , and of technologies safety provide modern society priority tasks Global cooperation and interdisciplinary approach this problems solution in doing important place The sun , the wind and water from energy use through carbon waste reduce It is possible . It is not only ecological problems solution to do , maybe of resources far term also serves the stability does .

Innovative technologies order eater international legal mechanisms working exit This process is important artificial intellect and genetic engineering in the field moral problems reduces .

Modern problems solution to do for biology , physics , computer science , social studies sciences such as various directions combined interdisciplinary approaches efficiency increases .

Reference

1. AS Zikriyoev . World universities in the ranking researcher scientists between yourself discovery Do it , Navruz , Tashkent 2020. ISBN.9789943659285.

2. Vorobeva *ES* , Krakovetskaya I.V. Reitingovaya otsenka konkurentosposobnosti zarubejnyx i otechestvennyx vysshih uchebnyx zadevaniy // Nauchnaya periodika: problemy i resheniya 6 (1). - 2016.

3. Demin P. V. Marketing sphere education and branding university. Review of the book: Papadimitriou A. (ed.) "Competition of brands and marketing in the sphere of higher education" Voprosy obrazovaniya. - 2019. - No. 4. - S. 294-

4. Kak vuzam Rossii vyyti na mirovoy uroven v NIOKR: pyat faktorov uspekha. - Mode of electronic access: https://trends.rbc.ru/ trends / education 5fb2b8769a79471a58cc5644?fbclid=IwAR2PyTRDhqYEDBODKw.

5. Nazaykinskaya O., Ovchinnikova N., "10 trends of budushchego obrazovaniya" // Business Education in Trends . - Online access mode: https://trends . skolkovo.ru /2017/10/10-trendov-budushhego-obrazovaniya/

6. Kudryashova E.V., Sorokin O.D., Bugaenko O.D. Vzaimodeystvie universitetov so sferoy proizvodstva kak element realizatsii "tretey missionii" // Vysshee obrazovanie v Rossii. - 2020. - No. 5. - S. 9-21.

7. Berlin University Alliance. - Mode electronic access https://www.berlin-universityalliance.de/en/index.html

8. Blasco Natividad, Brusca Isabel, Labrado Margarita Drivers for Universities' Contribution to the Sustainable Development Goals: An Analysis of Spanish Public Universities. Sustainability, 2021, 13, 89. https://dx.doi.org/10.3390/su13010089;

9. Richards G. A Guide to Virtual Universities for Policy-Makers. Commonwealth of Learning. 2015. – Regime electronic access :http://oasis.col.org/bitstream/handle/11599/1723/2015_Richards_Virtual-Universities Policy-Makers.pdf?sequence =1&isAllowed=y