IRSTI 14.35.09 https://doi.org/10.51889/2959-5762.2025.88.4.004

Tekesbayeva N.,[1] Oshanova N.,[1] Anuarbekova G.,[1]*
Turashova Sh.,[1] Kami A.[2]

[1] Abai Kazakh National Pedagogical University, Almaty, Kazakhstan
[2] International Information Technology University, Almaty, Kazakhstan

DEVELOPMENT AND IMPLEMENTATION OF AN ADAPTIVE LEARNING MODEL FOR UNIVERSITY STUDENTS IN PROGRAMMING BASED ON COGNITIVE STYLES

Abstract

This article examines the organization of adaptive learning within a digital educational environment in higher education. It introduces N. Fleming's VARK learning style model, which reflects the psychological characteristics of cognitive structures and students' preferred modes of interacting with educational content. The study also considers J. Bruner's methodology, which supports differentiated instruction based on dominant thinking styles and enables an individualized approach to analyzing and processing learning material.

Drawing on these theoretical foundations, an adaptive programming learning model was designed and implemented for students majoring in Informatics. As part of the implementation process, digital instructional modules were developed and integrated into the Khan Academy platform. In the experimental phase, students completed courses tailored to their cognitive styles, which led to an average 15% improvement in academic performance and enhanced understanding of complex subjects, including algorithms and data structures.

The findings confirm that the proposed model increases the effectiveness of the educational process and promotes deeper acquisition of programming skills by responding to individual learner needs. The study provides both theoretical and practical justification for employing digital technologies as instruments of adaptive learning, thereby contributing to the advancement of scientific and educational practices in the era of digital transformation.

Keywords: adaptive learning, VARK model, Bruner's methodology, cognitive styles, programming instruction, digital technologies.

Н.А.Текесбаева,[1] Н.Т.Ошанова,[1] Г.Д.Ануарбекова,[1]
Ш.П.Турашова,[1] Ками А.Е.[2]

[1]Абай атындағы Қазақ ұлттық педагогикалық университеті, Алматы қ., Қазақстан
[2]Халықаралық ақпараттық технологиялар университеті, Алматы қ., Қазақстан

КОГНИТИВТІК СТИЛЬДЕРГЕ НЕГІЗДЕЛГЕН ПРОГРАММАЛАУ БОЙЫНША УНИВЕРСИТЕТ СТУДЕНТТЕРІНЕ АРНАЛҒАН АДАПТИВТІ ОҚЫТУ МОДЕЛІН ӘЗІРЛЕУ ЖӘНЕ ІСКЕ АСЫРУ

Аңдатпа

Бұл мақалада жоғары оқу орнындағы цифрлық білім беру ортасы жағдайында адаптивті оқытуды ұйымдастыру мәселелері қарастырылады. Жеке тұлғаның когнитивті құрылымдары мен оқу контентімен өзара әрекеттесудің әртүрлі әдістеріне бейімділігіне негізделген Н. Флемингтің VARK оқыту стилі моделі ұсынылады. Сонымен қатар, Дж.Брунердің әдістемесі зерттеліп, негізгі ойлау түріне байланысты оқытуды жіктеу және оқу ақпаратын аналитикалықсинтетикалық өңдеуге жеке тәсіл анықталады.

Осы теорияларға сүйене отырып, «Информатика» мамандығы студенттеріне бағдарламалауды үйретудің адаптивті моделі әзірленіп, іске асырылды. Жүзеге асыру аясында сандық білім беру модульдері жасалып, Khan Academy платформасына интеграцияланды. Эксперименттік сынақ барысында студенттер оқу контенті олардың когнитивтік стильдеріне бейімделген курстардан өтіп, нәтижесінде оқу үлгерімі орта есеппен 15%-ға артты және алгоритмдер мен деректер құрылымдары сияқты күрделі тақырыптарды түсіну жақсарды.

Зерттеу нәтижелері ұсынылған модельдің білім беру үдерісінің сапасын арттырып, программалау саласын тереңірек игеруге мүмкіндік беретінін және оқытуды жеке қажеттіліктерге бейімдеудің тиімді екенін көрсетті. Зерттеудің маңыздылығы цифрлық технологияларды адаптивті оқытудың құралы ретінде пайдалану үшін теориялық және практикалық негіз беруінде, бұл цифрлық білім беру жағдайында ғылыми және білім беру ортасын дамытуға ықпал етеді.

Түйін сөздер: адаптивті оқыту, VARK моделі, Брунер моделі, когнитивтік стильдер, бағдарламалау оқыту, цифрлық технологиялар.

Текесбаева Н.А.,[1*] *Ошанова Н.Т.,*[1] *Ануарбекова Г.Д.,* [1]
Турашова Ш.П.,[1] *Қами А.Е.*[2]
[1] *Казахский Национальный педагогический университет имени Абая, г.Алматы, Казахстан*
Международный университет информационных технологии, г.Алматы, Казахстан

РАЗРАБОТКА И ВНЕДРЕНИЕ АДАПТИВНОЙ МОДЕЛИ ОБУЧЕНИЯ ПРОГРАММИРОВАНИЮ ДЛЯ СТУДЕНТОВ УНИВЕРСИТЕТА НА ОСНОВЕ КОГНИТИВНЫХ СТИЛЕЙ

Аннотация

В статье рассматриваются вопросы организации адаптивного обучения в условиях цифровой образовательной среды в высшем учебном заведении. Представлена модель стилей обучения VARK Н. Флеминга, основанная на индивидуальных психологических характеристиках когнитивных структур и предрасположенности к различным методам взаимодействия с учебным контентом. Также исследуется методология Дж. Брунера, поддерживающая дифференциацию обучения в зависимости от основного типа мышления и определяющая индивидуальный подход к аналитико-синтетической обработке учебной информации.

На основе данных теорий была разработана и внедрена модель адаптивного обучения программированию для студентов направления «Информатика». В рамках внедрения были созданы цифровые образовательные модули и интегрированы в платформу Khan Academy. В ходе экспериментального испытания студенты прошли курсы, где содержание адаптировалось под их когнитивные стили, что привело к среднему росту успеваемости на 15% и улучшению понимания сложных тем, таких как работа с алгоритмами и структурами данных.

Результаты исследования показывают, что предложенная модель повышает качество образовательного процесса и углубляет освоение программирования студентами, эффективно адаптируя обучение к индивидуальным потребностям. Значимость исследования заключается в предоставлении теоретической и практической основы для использования цифровых технологий как инструмента адаптивного обучения, что способствует развитию научнообразовательной среды в условиях цифрового образования.

Ключевые слова: адаптивное обучение, модель VARK, модель Брунера, когнитивные стили, обучение программированию, цифровые технологии.

Introduction. Education in modern society increasingly requires the application of new and more effective pedagogical technologies aimed at developing students' individual qualities and professional competencies. The formation of such characteristics as adaptability to life situations, independent acquisition of knowledge, the ability to apply knowledge in practice, critical thinking, rational problem solving, information literacy, communication skills, and teamwork has become one of the most important missions of higher education [1]. However, despite the active development of digital education, many graduates still demonstrate insufficiently formed personal and cognitive qualities required for successful professional activity.

The rapid development of digital technologies has created favorable conditions for transforming educational systems and improving the effectiveness of learning processes. Digital educational environments ensure flexible access to educational content, support interaction between students and learning resources, and enable the implementation of personalized and adaptive learning models [2]. In this context, digital technologies act not only as tools for content delivery but also as an effective adaptive learning instrument in higher education.

Adaptive learning systems allow instructional processes to be transformed by tailoring educational content to students' individual needs, cognitive characteristics, and learning preferences [3]. Such systems contribute to increased learning efficiency through real-time adjustment of educational trajectories and instructional strategies. The relevance of adaptive learning in higher education is further strengthened by the growing demand for personalized educational paths that enhance students' motivation, engagement, and academic performance.

Educational adaptation is understood as the systematic modification of the learning process in response to changing conditions through the application of pedagogical methods, tools, and technologies focused on individual learner needs. Researchers emphasize that adaptive learning promotes deeper comprehension of educational material and supports the development of higher-order cognitive skills [4].

Various studies analyze adaptive learning from different theoretical perspectives. Fleming and Mills proposed the VARK learning style model, which distinguishes visual, auditory, read/write, and kinesthetic learning preferences. Visual learners benefit from diagrams and images, auditory learners from listening-based activities, and kinesthetic learners from hands-on practice. Consideration of these differences makes it possible to design personalized learning trajectories and improve learning outcomes.

The successful application of digital platforms such as Khan Academy demonstrates that adaptive algorithms can automate content selection and optimize the learning process while accounting for students' preferred styles of information perception. Digitalization also significantly expands opportunities for mobile and distance learning, enabling students to access educational resources anytime and anywhere, thereby increasing their engagement and academic activity [5].

Research on the management of e-learning in higher education confirms that adaptive educational systems play a crucial role in ensuring effective learning based on flexible structures, personalized content, and continuous monitoring of students' academic progress. The construction of adaptive algorithms relies on several essential factors, including students' initial level of knowledge, learning speed, cognitive processing ability, individual perception of subject content and age-related characteristics. Recommendation technologies further enhance personalization by selecting optimal educational content according to learners' preferences and learning outcomes [6].

Digital technologies serve as an effective adaptive learning tool in higher education and form the basis for creating flexible, personalized, and efficient educational systems focused on students' cognitive, professional, and personal development.

Basic provisions. This study is devoted to designing and implementing an adaptive learning model for programming instruction within a digital educational environment, based on the VARK learning style framework and modern adaptive learning technologies. The research examines how these approaches can be integrated to individualize the learning process in accordance with students' cognitive styles, dominant thinking patterns, and professional training needs.

The adaptive learning model was implemented through digital instructional modules integrated into the Khan Academy platform. The use of adaptive technologies made it possible to organize personalized learning trajectories and continuously monitor students' progress through digital tools and intelligent recommendation mechanisms.

The application of the proposed adaptive learning model demonstrated a positive effect on students' academic outcomes. The experimental results revealed a 15% improvement in academic performance, as well as a higher level of understanding of complex programming concepts, including algorithms and data structures. The effectiveness of adaptive technologies was additionally confirmed through the evaluation of digital monitoring and real-time assessment systems.

The findings of the study confirm that adaptive learning significantly enhances the quality of programming education and emphasize the importance of integrating digital technologies into contemporary higher education practice as a key tool for personalized, competence-oriented, and technology-driven learning [7].

One of the primary criteria in designing adaptive learning processes is the learning style—a specific way in which a student absorbs, processes, and retains information. According to Fleming's VARK model, learning styles reflect psychological predispositions and cognitive characteristics that influence how students interact with educational content. The model categorizes learners based on their dominant perception channels (Table 1):

- Visual learners rely heavily on visual representations such as diagrams and charts; seeing information helps them understand and remember it.
- Aural learners process information most effectively through auditory input, including lectures and discussions, and may benefit from reading materials aloud.
- Read–write learners prefer text-based materials, engaging best through reading and written tasks.
- Kinesthetic learners grasp concepts through hands-on activities, practical experience, and physical engagement with the learning process.

Table 1 - Adaptive learning strategies based on the Vark model

Learning Style	Characteristics	Preferred Educational Tools and Strategies
Visual Learners	Prefer visual representations such as charts, diagrams, and illustrations.	Use infographics, mind maps, visual flowcharts, and presentations with minimal text and high-quality visuals.
Aural Learners	Learn best through auditory inputs like lectures, discussions, and audio recordings.	Incorporate podcasts, recorded lectures, collaborative group discussions, and speech-to-text tools.
Read/Write Learners	Prefer textual information, including reading and writing tasks.	Provide detailed handouts, reading assignments, and opportunities for written reflections or essays.
Kinesthetic Learners	Prefer hands-on activities and learning through direct interaction with educational material.	Integrate interactive simulations, real-life project-based learning tasks, physical models, and experiential learning opportunities.

Materials and Methods. The methodological framework of this study was developed to assess the creation and implementation of an adaptive learning model for programming instruction in a digital educational environment, drawing on the VARK learning style model and Bruner's cognitive methodology. The purpose of the research was to personalize the learning process by aligning instructional content with students' cognitive styles and dominant thinking patterns, thereby enhancing the effectiveness of programming education through digital technologies.

The study began with an extensive review of scholarly literature on adaptive learning, including works examining the VARK model, Bruner's theoretical principles, and the application of digital platforms such as Khan Academy in educational contexts. This review provided the theoretical basis for integrating cognitive styles and individualized learning approaches into the instructional process [8].

Following the literature analysis, digital learning modules were created and incorporated into the Khan Academy platform. These modules were constructed to adapt to students' identified learning styles - determined through VARK diagnostics - and to accommodate individual cognitive strengths and weaknesses. The content of the modules centered on key programming areas, particularly algorithms and data structures, to evaluate how adaptive learning influences comprehension and academic performance.

To examine the effectiveness of the adaptive learning model, an experimental study was conducted. Participants engaged with instructional materials adjusted to their learning styles, and their academic progress was continuously monitored. Additional data were collected through surveys and assessments. Findings from the experiment indicated an average improvement of 15% in students' academic performance, accompanied by notable gains in understanding complex programming concepts.

The collected data were subsequently analyzed to determine the overall impact of adaptive learning on students' educational outcomes.

Results. To support a learner-centered educational process, the Department of Informatics and Informatization of Education at Abai Kazakh National Pedagogical University developed an adaptive learning model for the Programming course, drawing upon N.Fleming's VARK model and J. Bruner's methodology [3]. This model aims to construct an instructional environment that responds to students' individual needs, preferred learning modalities, and thinking patterns.

The adaptive model was designed using diagnostic information obtained through VARK and Bruner assessments:

- VARK diagnostics (visual, auditory, read/write, kinesthetic) identify the preferred channel through which students perceive and process information, enabling the creation of personalized learning trajectories.
- Bruner's methodology evaluates students' dominant thinking style, allowing instructors to adjust the learning process based on whether learners rely primarily on analytical (convergent) or intuitive (divergent) reasoning. Students receive numeric indicators categorizing their predominant cognitive style.

The application of these two diagnostic approaches makes it possible to:

- personalize instruction according to students' perceptual and cognitive characteristics;
- adjust learning materials to better align with students' information-processing tendencies;
- ensure that each student can strengthen their cognitive advantages and address areas requiring development.

To determine each student's preferred learning style, a diagnostic test containing 16 situational questions with four possible responses was administered. The resulting numerical coefficient identified the dominant channel of information perception and guided the selection of an appropriate adaptive learning strategy (Figure 1).

The proposed model not only enhances the overall effectiveness of the learning process but also promotes a more profound understanding of the material by accounting for students' individual cognitive and psychological characteristics. The integration of adaptive learning strategies enables the creation of an instructional environment that aligns closely with learners' needs, abilities, and preferred modes of information processing [9].

The motivational–target component of the model is directed toward achieving the key educational goals associated with the development of professional programming competencies. A central function of this component is to foster students' motivation to engage with the learning material, thereby encouraging deeper involvement and sustained active participation throughout the instructional process.

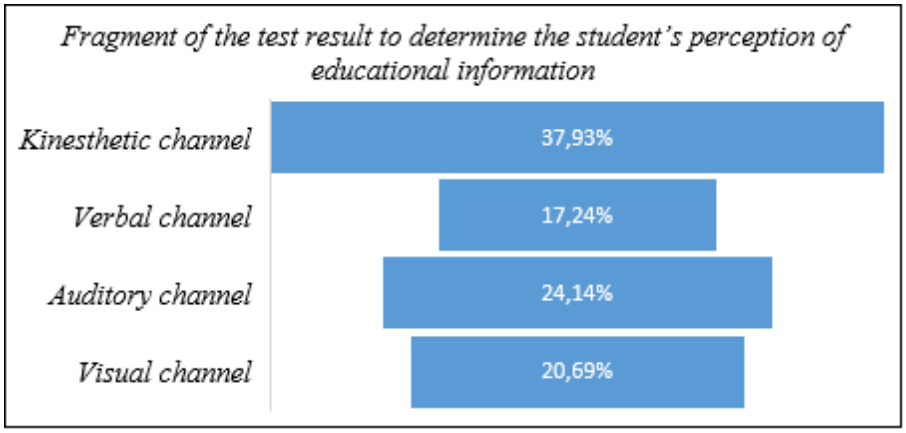

Figure 1 - Test result

The content - technical component focuses on ensuring the effective formation of professional competencies within the framework of the Programming course (Figure 2). This component encompasses the design and organization of instructional content and technological resources necessary to support adaptive learning and facilitate mastery of core programming concepts.

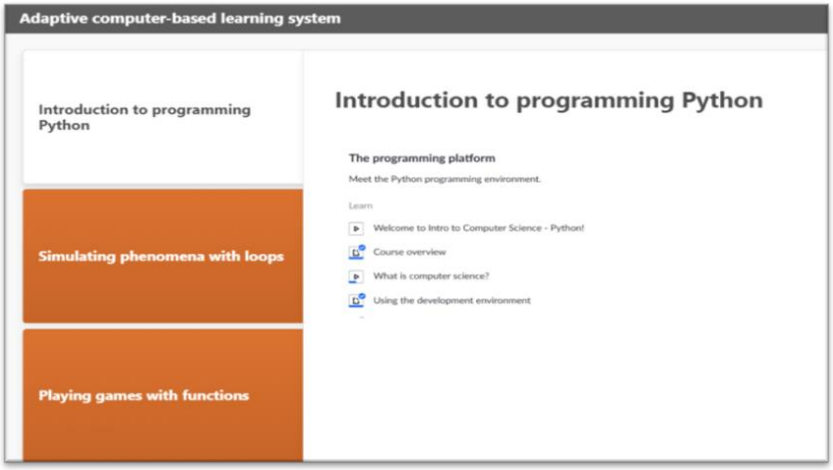

Figure 2- Fragment of educational material in the form of text

The content of the electronic course plays a crucial role in the implementation of this part of the model. It includes various didactic elements, which are developed and presented in various formats (Figure 3):

1. Text descriptions – containing explanations and theoretical material necessary for learning programming.
2. Graphical representations – diagrams, graphs, and photographs that help visualize complex concepts and algorithms.
3. Videos – video lectures, practical video sessions, and webinars that provide learners with a deeper understanding of the material through visual explanations.
4. Audio – audio lectures, audio dictionaries, and audio references that provide accessibility to educational content for auditory learners and allow learning while on the go or during rest periods.
5. Interactive modules – for modeling educational situations where students can apply their knowledge and skills in real-life contexts.

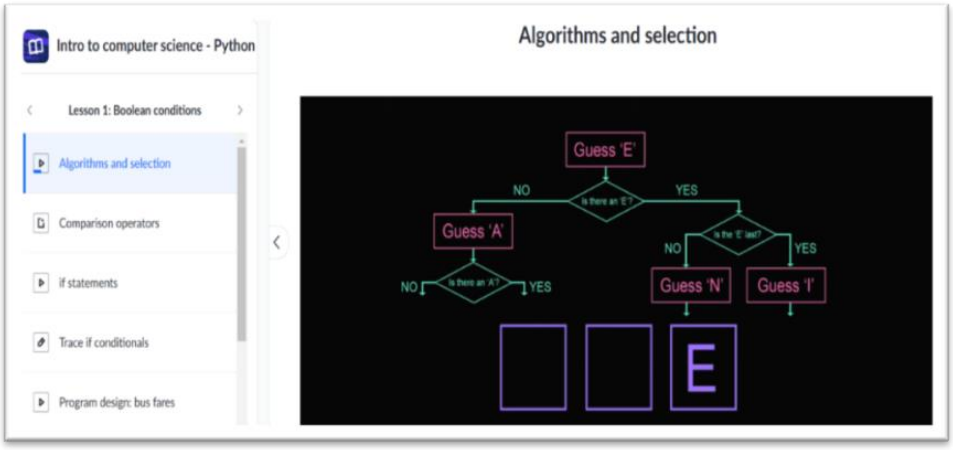

Figure 3 - Fragment of educational material in the form of diagrams and tables

Each information perception style (visual, auditory, kinesthetic, etc.) corresponds to an optimal way of presenting the material. Importantly, after identifying the student's predominant thinking style, they are provided with educational content adapted to their preferred style of information perception, ensuring more effective assimilation of the learning material.

The technological function of the adaptive learning model represents a key process that includes several important stages, ensuring personalized learning for students. The main adaptation algorithm is based on the VARK and J. Bruner questionnaires, which help identify students' preferences regarding information perception styles and thinking types. As a result of the testing, an individual learner profile is created, allowing the determination of the optimal learning strategy and, based on that, the development of adaptive educational content that best suits each student [10].

The result-oriented assessment component of the model is responsible for diagnosing the level of professional competencies development in students in the field of programming, particularly Python. This component performs several functions:

1. Diagnostic – to assess the current level of knowledge and skills of students.
2. Corrective – to adjust the learning process based on identified difficulties.
3. Reflective – for students to self-assess their progress and recognize the results they have achieved.

For organizing experimental learning, an initial survey was conducted with 31 students using the VARK and J. Bruner questionnaires. According to the survey results, it was found that:

48.39% of students prefer a kinesthetic learning strategy.

19.35% prefer a verbal strategy.

19.35% prefer an auditory strategy.

12.91% prefer a visual strategy.

In addition, it was found that 16.13% of students have a pronounced preference for one channel of perception, while 22.58% of students have a multimodal learning style, meaning they use multiple perception channels for better assimilation of the material (Figure 4).

To calculate the percentage distribution of students' learning preferences, the following formula was used (1):

$$Percentage\ of\ students = \left(\frac{Number\ of\ students\ with\ this\ learning\ style}{Total\ number\ of\ students}\right) * 100 \quad (1)$$

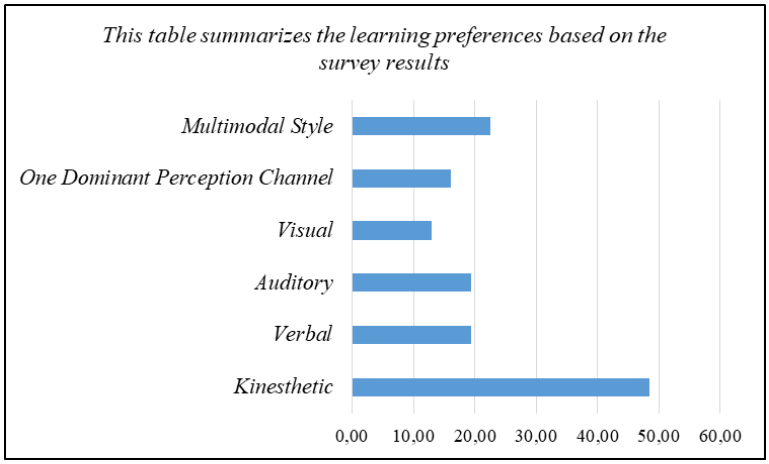

Figure 4- Distribution of Learning Styles

As part of the experimental training, an initial survey of 31 students was conducted using the VARK questionnaire and the J. Bruner test. Based on the survey results, students' preferences for perceiving information (kinesthetic, verbal, auditory, visual) were identified, which made it possible to adapt the educational content to their individual learning styles [11-13]. After the implementation of the adaptive approach, which included interactive modules, graphic diagrams, audio and text materials in accordance with students' preferences, control testing was conducted.

Analysis of the results showed that the use of adaptive content led to an average increase in student performance by 15%. This is due to more effective assimilation of the material, especially on such complex topics as algorithms and data structures (table 2).

Table 2 - Results before and after implementing adaptive learning for students

Student	Score before adaptive learning (%)	Score after adaptive learning (%)	Improvement (%)
Student 1	70%	80%	15%
Student 2	65%	75%	15%
Student 3	75%	90%	15%
Student 4	60%	70%	10%
Student 5	80%	90%	10%
…	…	…	…
Average	70%	80%	15%

$$Increased\ academic\ performance\ (\%) = \frac{X_2 - X_1}{X_1} * 100 \quad (2)$$

where:

X_1 — *average score before adaptation (initial value).*

X_2 — *average score after adaptation (new value).*

Discussion. The purpose of this study was to examine the impact of adaptive learning on student performance, specifically in the context of programming education. The study focused on determining how tailoring content to individual learning preferences using adaptive methods can improve student outcomes. Survey results showed that students' information processing preferences – such as kinesthetic, verbal, auditory, and visual learning channels – play a critical role in how effectively they learn.

The significant improvement in performance (up 15%) observed after implementing adaptive learning methods suggests that tailoring content to students' preferred learning styles can lead to more effective learning. This is particularly evident in complex topics such as algorithms and data structures, where students were able to engage more deeply with the material through tailored content that included interactive modules, graphics, and audiovisuals. The results align with the goals of tailoring instructional strategies to promote better understanding and retention of complex subjects.

Teachers reported a significant difference in student engagement after adapting the learning materials, indicating a shift towards a more effective and enjoyable learning experience. This suggests that the use of adaptive learning can not only improve academic performance but also increase student motivation. Moreover, the results of the VARK and J. Bruner surveys confirmed that a multimodal approach that includes different learning channels is effective in meeting the diverse needs of students.

The results highlight the need to incorporate adaptive learning technologies into modern educational frameworks, especially in computer science, where the rapid pace of change requires constant updating of curricula and teaching strategies. Integrating adaptive learning can help meet this demand by allowing real-time adjustments to content delivery to ensure that students receive the most relevant and accessible material for their learning styles.

Conclusion. Based on the findings, the study recommends several strategies for integrating adaptive learning into computer science curricula:

- adapt educational content to students' preferred learning styles by using multimedia resources such as interactive simulations, audio-visual content, and text explanations to accommodate diverse preferences;
- implementation of adaptive learning platforms that allow for real-time customization of learning materials, ensuring that students learn content at their own pace and in accordance with their learning style;
- provide professional development to educators on the effective use of adaptive learning tools and techniques, ensuring that they are prepared to meet diverse learning needs;
- encourage the use of multimodal approaches that combine visual, auditory, and kinesthetic elements to engage students in a variety of ways, thereby improving their understanding and retention of material;
- include more hands-on project-based learning opportunities that allow students to apply adaptive learning in real-world contexts, such as coding assignments, app development projects, and group collaboration;
- implement continuous formative assessment to track student progress and adjust the learning path accordingly, ensuring that students are able to master each concept before moving on to more complex material.

By implementing these recommendations, can create more personalized and engaging learning experiences for students. This approach will not only improve academic performance, but also foster a deeper understanding of complex subjects, especially in the context of rapidly evolving fields like computer science.

The results of control activities, as well as diagnostics of the level of professional training of students, confirmed the effectiveness of the implementation of the proposed adaptive learning model. This confirms that the described study contributes to the personalization of education and is an effective tool in the digital educational environment. This approach can be recommended for wide use in educational practice, especially in the context of e-learning, where flexibility and an individual approach to each student are crucial.

References:

1. Tekesbaeva N., Kultan Y., Ongarbayeva A., Ibraev A. and Yerimbetova Zh. Digital technologies as an adaptive learning tool in higher education. E3S Web Conf., 403 (2023) 08023 DOI: https://doi.org/10.1051/e3sconf/202340308023
2. Neil D. Fleming, Colleen E. Mills. Not Another Inventory, Rather a Catalyst for Reflection. Education, Psychology.1992. https://doi.org/10.1002/J.2334-4822.1992.TB00213.X
3. El-Sabagh H. Adaptive e-learning environment based on learning styles and its impact on development students' engagement. International Journal of Educational Technology in Higher Education,2021. https://doi.org/10.1186/s41239-021-00289-4
4. Mann B. The One World Schoolhouse: Education Reimagined by Salman Khan. New York: Twelve, 2012. https://doi.org/10.1086/674373
5. Sarrab M., Elgamel L., Aldabbas H. Mobile Learning (M-Learning) and Educational Environments. International Journal of Distributed & Parallel Systems. 3,2012. 31-38. https://www.airccse.org/journal/ijdps/papers/0712ijdps04.pdf (date of application: 13.12.2024)
6. Tarkhov S.V. Managing E-learning in Higher Educational Institutions of Kazakhstan. Kazakh University Press,2020. https://doi.org/10.1016/j.sbspro.2013.10.118
7. Zhang X., Tlili A., Shubeck K. et al. Teachers' adoption of an open and interactive e-book for teaching K-12 students Artificial Intelligence: a mixed methods inquiry. Smart Learn. Environ. 8, 34.2021 https://doi.org/10.1186/s40561-021-00176-5. (date of application: 14.12.2024)
8. Sarmanova J., Kostolanyova K. Adaptive E-Learning: From Theory to Practice. International Journal of Information and Communication Technologies in Education, 2015. https://doi.org/10.1515/ijicte-2015-0018
9. Plass J., Pawar Sh. (2020). Toward a taxonomy of adaptivity for learning. Journal of Research on Technology in Education. https://doi.org/10.1080/15391523.2020.1719943
10. Sumanth T. Recommendation Systems for Personalized Learning: A Data-Driven Approach in Education, 2020. https://iaeme.com/Home/issue/JCET?Volume=4&Issue=2 (date of application: 14.12.2024)
11. Текесбаева, Н., Ошанова, Н., Жунусова Л.И, Ануарбекова, Г. Инновационные подходы цифровизации образования на основе адаптивных технологий обучения. Вестник Казпу имени Абая. Серия: Физико-математические науки. 85, 1 (мар. 2024), 296–304. https://doi.org/10.51889/2959-5894.2024.85.1.028
12. Текесбаева N., Ошанова N., Буканова А., Байзакова, Е. И Ками А.. Экспериментальное исследование эффективности адаптивного обучения программированию будущих учителей информатики. Вестник Казпу имени Абая. Серия: Физико-математические науки. 91, 3 (сен. 2025), 307–318. https://doi.org/10.51889/2959-5894.2025.91.3.028
13. Oshanova N., Bolshevikovna G., Tekesbayeva N., Turashova S., Anuarbekova G., & Bukanova A. Evaluación de la Eficacia de un Sistema de Monitoreo de Ejercicios en Tiempo Real Impulsado por Inteligencia Artificial en el Aprendizaje Colaborativo Asistido por Computadora. Retos, 67,2025. 580-596. https://doi.org/10.51889/2959-5894.2024.85.1.028

References:

1. Tekesbaeva N., Kultan Y., Ongarbayeva A., Ibraev A. and Yerimbetova Zh. Digital technologies as an adaptive learning tool in higher education. E3S Web Conf., 403 (2023) 08023 DOI: https://doi.org/10.1051/e3sconf/202340308023
2. Neil D. Fleming, Colleen E. Mills. Not Another Inventory, Rather a Catalyst for Reflection. Education, Psychology, 1992 https://doi.org/10.1002/J.2334-4822.1992.TB00213.X
3. El-Sabagh H. Adaptive e-learning environment based on learning styles and its impact on development students' engagement. International Journal of Educational Technology in Higher Education,2021. https://doi.org/10.1186/s41239-021-00289-4
4. Mann B. The One World Schoolhouse: Education Reimagined by Salman Khan. New York: Twelve, 2012. https://doi.org/10.1086/674373
5. Sarrab M., Elgamel L., Aldabbas H. Mobile Learning (M-Learning) and Educational Environments. International Journal of Distributed & Parallel Systems. 3,2012. 31-38. https://www.airccse.org/journal/ijdps/papers/0712ijdps04.pdf (date of application: 13.12.2024)
6. Tarkhov S.V. Managing E-learning in Higher Educational Institutions of Kazakhstan. Kazakh University Press, 2020. https://doi.org/10.1016/j.sbspro.2013.10.118
7. Zhang X., Tlili A., Shubeck K. et al. Teachers' adoption of an open and interactive e-book for teaching K-12 students Artificial Intelligence: a mixed methods inquiry. Smart Learn. Environ. 8,2021. 34. https://doi.org/10.1186/s40561-021-00176-5. (date of application: 14.12.2024)
8. Sarmanova J., Kostolanyova K. Adaptive E-Learning: From Theory to Practice. International Journal of Information and Communication Technologies in Education, 2015. https://doi.org/10.1515/ijicte-2015-0018
9. Plass J., Pawar Sh. Toward a taxonomy of adaptivity for learning. Journal of Research on Technology in Education,2020. https://doi.org/10.1080/15391523.2020.1719943
10. Sumanth T. Recommendation Systems for Personalized Learning: A Data-Driven Approach in Education. https://iaeme.com/Home/issue/JCET?Volume=4&Issue=2 (date of application: 14.12.2024)

11. Tekesbaeva N., Oshanova N., Zhunusova L., Anuarbekova G. Innovatsionnye podkhody tsifrovizatsii obrazovaniya na osnove adaptivnykh tekhnologii obucheniya. Vestnik KazNPU imeni Abaya. Seriya: Fiziko-matematicheskie nauki, 85(1),2024. 296–304. https://doi.org/10.51889/2959-5894.2024.85.1.028

12. Tekesbaeva N., Oshanova N., Bukanova A., Baizakova E., Kami A. (2025). Eksperimental'noe issledovanie effektivnosti adaptivnogo obucheniya programmirovaniyu budushchikh uchitelei informatiki. Vestnik KazNPU imeni Abaya. Seriya: Fiziko-matematicheskie nauki, 91(3), 307–318. https://doi.org/10.51889/2959-5894.2025.91.3.028

13. Oshanova, N., Bolshevikovna, G., Tekesbayeva, N., Turashova, S., Anuarbekova, G., & Bukanova, A. Evaluación de la Eficacia de un Sistema de Monitoreo de Ejercicios en Tiempo Real Impulsado por Inteligencia Artificial en el Aprendizaje Colaborativo Asistido por Computadora. Retos, 67,2025. 580-596. https://doi.org/10.51889/2959-5894.2024.85.1.028

IRSTI 14.35.05 https://doi.org/10.51889/2959-5762.2025.88.4.005

*Abdigapbarova U.,[1] Utemisova Z.[1]**

[1]Abai Kazakh National Pedagogical University, Almaty, Kazakhstan

MODEL OF THE FORMATION OF STUDENTS' SOCIAL RESPONSIBILITY THROUGH VOLUNTEER ACTIVITIES

Abstract

This article presents the development and theoretical justification of a pedagogical model aimed at fostering students' social responsibility through the systematic integration of volunteer activity into the higher education curriculum. The methodological framework of the study is grounded in pedagogical modeling, a systematic review of scholarly literature, and the synthesis of theoretical and empirical approaches. The resulting model comprises four interrelated components: target, content, procedural, and evaluative-resultative. The scientific contribution of this work lies in the construction of a coherent pedagogical framework that integrates contemporary theories of moral identity, social identity, and transformative learning, while reflecting current formats of volunteer engagement and educational practice. The model is based on validated principles of learning environment design and is oriented toward the cultivation of civic consciousness, an understanding of the social relevance of future professional activity, and a readiness for socially engaged behavior. The findings of this study may inform the implementation of volunteerism within university curricula and the design of educational strategies aimed at promoting civic responsibility and social inclusion among students.

Keywords: social responsibility, volunteer activity, higher education, pedagogical model, civic engagement.

*У.М.Әбдіғапбарова,[1] Ж.Утемисова [1]**

[1]Абай атындағы Қазақ ұлттық педагогикалық университеті, Алматы қ., Қазақстан

СТУДЕНТТЕРДІҢ ВОЛОНТЕРЛІК ҚЫЗМЕТІ БАРЫСЫНДА ӘЛЕУМЕТТІК ЖАУАПКЕРШІЛІКТІ ҚАЛЫПТАСТЫРУДЫҢ МОДЕЛІ

Аңдатпа

Мақалада студенттердің әлеуметтік жауапкершілігін қалыптастыруға бағытталған педагогикалық модельді жоғары оқу орындарының білім беру үдерісіне волонтерлік қызметті енгізу арқылы әзірлеу және оның теориялық негіздемесі ұсынылады. Зерттеудің әдіснамалық негізін педагогикалық модельдеу қағидаттары, ғылыми әдебиеттерге жүйелі талдау және теориялық әрі эмпирикалық тәсілдердің синтезі құрайды. Әзірленген модель төрт өзара байланысты компоненттен тұрады: мақсатты, мазмұндық, үдерістік және бағалау-нәтиже блоктары. Зерттеудің ғылыми жаңашылдығы - моральдық бірегейлік, әлеуметтік сәйкестілік және трансформативтік оқыту теорияларын заманауи волонтерлік қызмет формалары мен білім беру тәжірибелерімен ұштастыру негізінде тұтас педагогикалық модельді әзірлеу. Модель білім беру ортасын жобалаудың қағидаттарына сүйенеді және азаматтық ұстанымды қалыптастыруға, кәсіби қызметтің әлеуметтік маңызын ұғынуға, эмпатия мен қоғамдық пайдалы әрекеттерге дайындықты дамытуға бағытталған. Алынған нәтижелер волонтерлік қызметті жоғары оқу орындарының оқу курстарына кіріктіруде, сондай-ақ студенттердің азаматтық жауапкершілігі мен әлеуметтік белсенділігін дамыту бағдарламаларын жобалауда тәжірибелік тұрғыда қолданылуы мүмкін.

Түйін сөздер: әлеуметтік жауапкершілік, волонтерлік қызмет, жоғары білім, педагогикалық модель, азаматтық белсенділік.