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MODEL OF ARTIFICIAL INTELLIGENCE AND CHATGPT USE FOR STUDY PERSONALIZATION IN HIGHER EDUCATION[1]

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Annotation. *Artificial intelligence is being quickly implemented for students' study in 2022–2024 (both Ukraine and worldwide). Therefore, new AI policies, rules and models become increasingly more relevant. The article purpose is creation of the AI and ChatGPT use model to personalize study in higher education. The personalized study concept is analyzed. Differences between personalized and traditional education are defined. Personalized study is regarded as flexible, interactive and individually adaptable. AI can focus on the primary role of students in the education system with study adjustment to their goals, interests and needs. Such an approach promotes a better preparation of students as future labor market participants, which ensures development of their social and psychological values. Via the binary assessment method, the AI impact on study personalization was considered (medium result: 72.7 %). AI tools proved to satisfy most needs of personalized study. To personalize study in higher education, we proposed the AI and ChatGPT use model consisting of three interrelated units: study process, AI integration, study results. Besides, main groups of personalization strategies were classified (by study personalization levels; by interaction with students; by AI integration scope; by AI use aims). AI integration strategies focus on raising academic performance, satisfying students and creating specific educational products. Selection of AI integration strategies within the educational process as well as study environment of the higher education institution is defined via study transformation goals and readiness to implement new technologies.*

Keywords: *binary assessment, higher education, performance, model, personalized study, study results, strategy, technology, artificial intelligence (AI), ChatGPT, SWOT analysis.*

General statement of the problem and its connection with the most important scientific or practical tasks. Today, achievements in natural language processing are widely applied in different branches, including education. The AI use may enhance study performance and quality.

Surveys demonstrate that students actively use AI tools for study. According to the Chegg Com-

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pany research, 40 % of all 11,816 respondents from 15 countries resort to the generative AI in study. The most active AI users are students from Kenya (63 %), Saudi Arabia (62 %) and Spain (62 %) [1, c. 5–8]. The same concerns China (84.9 %) [2].

Survey results among European students reflect similar high trends of the AI use as well:

Germany and Poland – 63.4 % and 68 % use AI tools for study, respectively;

The United Kingdom – 62 % use AI tools sometimes, 31 % apply them at least once per month;

French – 55 % periodically use generative AI tools, including for content creation (51 %) [3–6].

Within 2,018 polled Ukrainians, 5.6 % employ AI tools for study [7]. In particular, AI is widely popular among engineering students (85 %) [8].

Along with a global AI study application, there are still unsolved issues of providing the higher education branch with AI standards and models in general. The latter also concerns the AI study personalization.

Analysis of recent research and publications. *The study personalization concept*

The study personalization concept was introduced by B. S. Bloom in 1984. The researcher considered the two-sigma problem when there was the study performance comparison between a conventional class and a tutor. The latter case turned out to produce better results. Therefore, the conventional class approach is not so effective as it can seem [9].

According to A. Shemshack and J. M. Spector, personalized education is a learning complex adaptable to individual knowledge, experience and interests. It contributes to promotion and support of students' desired results [10]. H. V. Tkachuk notes the main distinctive feature of personalized study is adaptation of its processes, technologies and styles to interests of each student [11]. O. A. Chemerys and L. M. Kibenko argue the personalized model aims at students' goals and new study products. Here, students can coordinate the knowledge and skill acquisition. They may select tasks by difficulty and content, develop flexible and hard skills as well as obtain proper feedbacks [12].

G. Quandeng analyzed stages of personalized study integration in terms of education performance and possible disadvantages. In particular, he offers pupils diagnosing and dividing into four groups by their abilities and skills. Also, it is relevant to provide individualized methods, tasks and their control. Inclusion of individual and psychological values is also significant in personalized study [13].

Therefore, traditional education is characterized by a unified approach to students' mastering the curriculum. As information consumers, students are passive in study. On the contrary, personalized education is flexible and creative. It offers a convenient study mechanism with a focus on individual needs and peculiarities of each student. The latter becomes a producer of new information (Table 1).

Table 1

Comparison of traditional and personalized education

Criterion	Traditional education	Personalized education
1	2	3
Definition	Focus on information memorization and retrieval	Focus on creative thinking, communication and practical preparation
Approach to study	Ready study model. Informational proposal corresponds to a single standard	Basic study model. It is supplemented with elements according to students' needs
Study methods	Totalitarian or authoritarian	Democratic
Students' role in study	Students are study subordinate objects	Students are subjects that participate in developing study approaches and satisfy own learning needs
Lecturers' role in study	Lecturers reproduce and distribute study material	Lecturers participate in developing an active student personality, determining his individual and social goals. They act as consultors or mentors
Interaction between lecturers and students	Lecturers define all study aspects. Students perceive, analyze and reproduce the information they got from lecturers	Lecturers initiate study, make students become active learning subjects, provide individual feedbacks. Students learn the material and reproduce information acquired from different sources
Control features	Formal, non-individualized, hard control	Flexible, individualized control. Self-control, reflection
Creativity	Only lecturers are creative. Students perceive ready-made information	Both lecturers and students are creative
Study results	Acquired knowledge	Acquired knowledge and skills with their creative use in practice
Planning	Structured environment as fixed groups with curricula and schedules	Dynamic student groups according to changeable study needs. Compilation of respective individual courses

Continuation of table 1

1	2	3
Multimedia role	Secondary. Written content and printed books prevail	Primary. Digital content prevails to track study performance
Study pace	Students study in an identical moderate pace, which is defined by their lecturer	Students select a necessary study pace independently (as to material understanding)
Assessment methods	Final assessment as periodical tests. Unified written tasks for all students	No fixed assessment. Study performance is regularly checked after each lesson

Source: based on [13; 14; 15; 16]

Therefore, the education personalization concept changes roles of students and lecturers. The former are active subjects with responsibility for study. The latter are advisors rather than information reproducers and study managers. It means that lecturers assist in material revision as well as accept innovative and creative decisions of students. The main advantage of personalized study is increase of students' motivation.

R. Felder and L. Silverman supplement the personalized study concept in analyzing assessment and perception methods in engineering education. They underline most educational components are parallel to one another. Students of visual thinking prefer diagrams, tables and figures. Students of intuitive thinking prefer abstract notions to concrete ones. A debatable problem of study personalization is impossibility of adjustment to each student in the lecture room. The researchers constructed an alternative model of studying and teaching styles that are adapted to most students (Table 2) [17].

Therefore, personalized education is characterized by a more flexible study approach to individual and psychological qualities as well as interests of students. However, this approach realization requires more time and other resources from lecturers and educational institutions. Nevertheless, application of technologies provides new possibilities to unfold an adaptive and interactive study environment.

Use of technologies in higher education

The COVID-19 pandemic has converted the technological basis of the education system. Via introduction of educational online platforms, students may get new knowledge regardless of their residence.

Active interaction of students and lecturers with study technologies is called as the term "Edtech" [18, p. 19; 19, p. 4; 20, p. 1–18; 21, p. 338–339]. According to T. Tymoshchuk, Edtech is the architecture that uses Internet possibilities and ensures a personalized approach to each student [22].

R. Raja and P. C. Nagasubramani note that study technologies comprise curriculum components, study tools, auxiliary means of providing information, factors of education improvement. Via technologies, institutions can make education interactive and lively rather than passive and reactive [23, p. 34]. B. Herold argues that modern technologies may support the personalized study concept. In particular, educational software and digital systems are more adaptive to needs of each student. It determines students' performance with educational adjustment to their study pace and even emotional state [24]. Besides, technologies assist in searching for information sources, which makes tasks diversified [25].

L. Major, G. A. Francis and M. Tsapali state that low-income and middle-income regions may employ personalization and technologies to enhance students' performance in mathematical and linguistical sciences [26]. According to A. Bartolomé, L. Castañeda and J. Adell, there are two approaches of students' involvement into study: linear and branched. The former offers the same material learned with different speed many times. The latter proposes various material differing in achieved students' performance [27].

Thus, technologies raise study personalization. One of such technologies is artificial intelligence (AI) [28–31].

Table 2

Model of studying and teaching styles by R. Felder and L. Silverman

Dominant studying style		**Respective teaching style**	
Intuition	Perception	Concrete	Material content
Sensor functions		Abstract	
Visual perception	Input information	Visual	Presentation
Audial perception		Verbal	
Induction	Organization	Induction	Organization
Deduction		Deduction	
Active	Processing	Active	Student's participation
Reflexive		Passive	
Consecutive	Understanding	Consecutive	Prospect
Global		Global	

Source: [17, p. 675]

AI influence on study personalization

Most researchers believe AI tools contribute significantly to study conversion into a personalized form [32–38].

International organizations like UNESCO, OECD and EU adopted principles of AI educational use. They comprise transparency and clarity, anthropocentrism and justice, inclusive and sustainable development, welfare, reliability and security, accountability [39, p. 69].

Ethical rules of AI educational use for the European Network for Academic Integrity were considered by T. Foltynek et al. The authors argue that interaction with students must focus on oral answers and group assignments to apply analytical and creative skills. AI should generate curricula, check tasks and control study performance [40].

K. F. T. Chiu et al. discuss a generalized idea of the AI educational role. They note that personalized study is possible via adaptation of content, teaching methods, assessment and administration to individual needs and abilities of each student. It is achieved due to AI [41]. C. K. Y. Chan defines key topics to enhance standards of AI educational use: academic integrity and ethical dilemmas, data privacy, AI access, assessment and testing, development of AI use skills, AI use influence monitoring [42].

M. A. Cardona, R. J. Rodríguez and K. Ishmael analyze main problems of AI educational integration as to four influence spheres: study, teaching, assessment and research. According to detected problems, the authors single out the AI use rules (anthropocentrism, justice, security, ethics, performance, transparency). Also, they provide recommendations to development of the AI educational use policy. Humans make important study and control decisions to ensure security, performance and reasoning. Therefore, the AI integration model should correspond to desired goals and set principles. Besides, it should ensure cultural resilience, justice, inclusion and improvement of student competences. Guidelines, preventive educational measures and plans of AI trust promotion among academic communities must be adopted. Academic members are involved on each stage of research and development as well as educational technology integration [43].

M. Marienko and V. Kovalenko state that AI is effective in automated assessment and performance monitoring. Simultaneously, AI can decrease lecturers' roles, inhibit creative and critical thinking skills, divide students by their social and economic status [44, p. 50–51]. According to V. Božić and I. Poola, ChatGPT promotes academic fraud: it generates a text based on many papers without any references [45].

I. O. Ushakova and O. A. Pedan state that the efficient AI use depends on quantity of information sources in the base. It defines current quality and accuracy of algorithm execution [46, p. 31].

M. Sullivan, A. Kelly and P. McLaughlan confirm that the main problem of AI use (like ChatGPT) is denial of their study integration. In particular, most articles have negative statements about academic integrity violation and recommendations for students' AI refusal. Least works provide a clear institutional policy of ChatGPT use [47, p. 3]. However, modern AI technologies are partially integrated into education. There is an increasing trend among students to employ AI tools for study needs [48, p. 73].

R. S. Berdo, V. L. Rasiun and V. A. Velychko focus on methods and mechanisms of AI use to construct respective standards in future. AI is regarded as a potentially efficient educational tool in case of its ethical application [49, p. 4–6]. In particular, the authors explained key AI integration issues at educational institutions: data privacy, transparency, responsibility, antidiscrimination, social interaction and influence on education.

S. O. Kulieshov discusses the AI educational impact at American institutions. The most efficient way of AI use in personalized education is creation of systems as virtual assistants and tutors [50, p. 152–153]. C. Mehner and L. Köbis state that AI may serve as an advisor to ensure personalized education. The researchers established interrelation between advisorship and AI [51].

O. V. Spivakovsky et al. generated the study interaction model among lecturers, students and AI systems. The model is based on partnership between lecturers and students as well as formation of certain logical AI queries [52]. AI study problems are also considered: academic integrity, ethical norms, data privacy, potential social and economic threats. O. V. Panukhnyk argues that AI misuse may lead to decrease of cognitive abilities among students and lecturers [53]. Simultaneously, N. V. Bakhmat notes that AI integration can solve problems of traditional study: restricted access to study resources, optimized administration, distance learning [54].

A. Jungherr analyzes advantages and disadvantages of ChatGPT use in thesis preparation. Also, he gives recommendations about AI use to teach students [55]. R. Jürgen et al. argue that interaction between students and lecturers, as to the ChatGPT use, must be based on mutual trust [56].

Therefore, the above-mentioned works define advantages, disadvantages and possible consequences of the AI and ChatGPT use in higher education. Most researchers believe that education reforming via AI tools is inevitable.

Consequently, it is reasonable to construct the AI and ChatGPT use model to provide study personalization in higher education.

Formation of the objectives of the article (task statement). The article purpose is development of the AI and ChatGPT use model to provide study personalization in higher education.

The research methods are analysis and synthesis, comparison (to consider traditional and personalized study), induction and deduction.

Presentation of the main research material with full justification of the scientific results obtained. According to O. Sodel, one of the main AI educational use advantages is an opportunity to provide personal experience among students. AI ensures individual feedback so that students can reconsider their attitude to study [57]. C. Mötteli, K. Reusser, U. Grob and C. Pauli investigated the personalized education impact on middle-school pupils' satisfaction with study. The authors have established key features of personalized education: pupils' suffrage, briefing and emotional support among lecturers [58].

H. Dumont and D. D. Ready note that personalized education can solve the justice issue. Usually, the technological approach to personalized education does not include social and emotional needs. Thus, low-performance students get a great academic load, which leads to insufficient activity or knowledge non-correspondence to offered tasks [59].

Besides, scientists describe key elements of the best personalized study practice: focus on students' profiles, flexible study paths, preference of study process to test results, competence and mastership, students' initiative, decisions based on acquired data, no attachment to study place, development of carrier skills [60–63].

I. Yuyun and D. Suherdi proposed such components of personalized education: inclusion of study, individual and cognitive styles, development of self-control and self-regulation among students, study pace flexibility, provision of intellectual study environment and respective tools, use of intellectual teaching systems, data analysis, wearable devices [64].

R. Culatta represents another idea of personalized education elements: availability of student' own devices, real-time feedback, students' access to own data, use of regular occurrences [65].

The above-mentioned features were summarized to provide a general AI impact on personalized study in higher education (Table 3). To assess it, we employed a binary scale (0 – absent impact; 1 – present impact).

Consequently, AI impacts on 8 of 10 features of personalized study (72.7 % of influence, that is the medium level).

Therefore, AI tools satisfy most needs of personalized study. However, not all people have an access to AI technologies: there can be a lack of practical skills, experience and resources [70].

Table 3

AI impact on personalized study in higher education

№	Feature of personalized study	Impact (0 – absent impact; 1 – present impact)	Mechanism of impact
1	Personalized study path	1	Synchronic and asynchronic virtual classes. Generative AI reproduces personalized study content (as to students' needs)
2	Real-time feedback	1	Automated assessment and administration for lecturers' focusing on interaction with students. Chat bots analyze own progress and improve skills
3	Focus on students' profiles, their study styles	1	Internet of things and intellectual algorithms analyze mass data on study styles, abilities and weaknesses of students. Possible recommendations to produce individual education plans
4	Independence of study place	1	Online platforms and AI-based tutoring systems
5	Data analysis and study analytics	1	Analytical data track students' performance, methods and sources for content adjustment
6	Availability	0	Possible AI unavailability due to skills absence, technical restrictions, lack of data or negative perception
7	Cognition, career ambitions, creative and critical skills	1	Game-like and interactive tasks based on analysis of students' characteristics
8	Students' initiatives (suffrage, self-control, self-regulation)	1	Interactive virtual assistants attract students to discussions, model situations and analyze progress. Machine learning evaluates input data on students and offers necessary tasks
9	Students' promotion via competence and mastership	1	Computer-aided adaptive learning assesses material understanding and corrects study paths
10	Satisfaction of social and emotional needs	0	Tight connection between lecturers and students. The technological approach minimizes social interaction between students and lecturer's role in emotional support
Total		8	

Source: authors considerations based on [58–69]

That produces a gap in study possibilities among students with different social and economic statuses. Besides, AI cannot satisfy social and emotional needs of students. It underlines the lecturer's role in support for students to acquire social and cognitive skills. Simultaneously, future plans of AI technology development in the study sphere may be predicted.

A generalized model of AI and ChatGPT use to personalize study is represented in Figure 1. The model comprises three units.

1. Study process: compulsory and optional courses, their arrangement.

2. AI integration: data and factors of study personalization (age, hobbies, temperament, prevailing study style, abilities, achievements, etc.) and labor market demands for a certain career competence. This information generates a personalized study path to select optional courses and arrange them. It is also employed to simulate students' mastering professional and soft skills.

3. Study results: theoretical knowledge in the studied specialty and skill levels. Here, students' performance and study satisfaction are relevant indicators.

Thus, the model of AI and ChatGPT use combines labor market and higher education. It is flexible for study personalization.

The SWOT analysis of AI integration into study personalization is shown in Table 4.

The SWOT analyses defined AI integration strategies for study personalization at higher education institutions (Table 5).

Thus, we single out four strategy types.

1. By study personalization levels:

– the high-level strategy of study personalization. It means creation of maximally personalized educational experience, which is adjusted to unique needs of each student. AI constantly adapts the content of courses and assessment via data on current study performance. Such an approach raises student's attraction and his performance. However, it requires many resources and complex AI algorithms;

– the medium-level strategy of study personalization. Here, a balanced approach is applied with personalized study paths and standardized curricula. AI tools correct the content via general performance trends and popular study models. It ensures a reasonable individual support without any losses typical for the high-level strategy of study personalization;

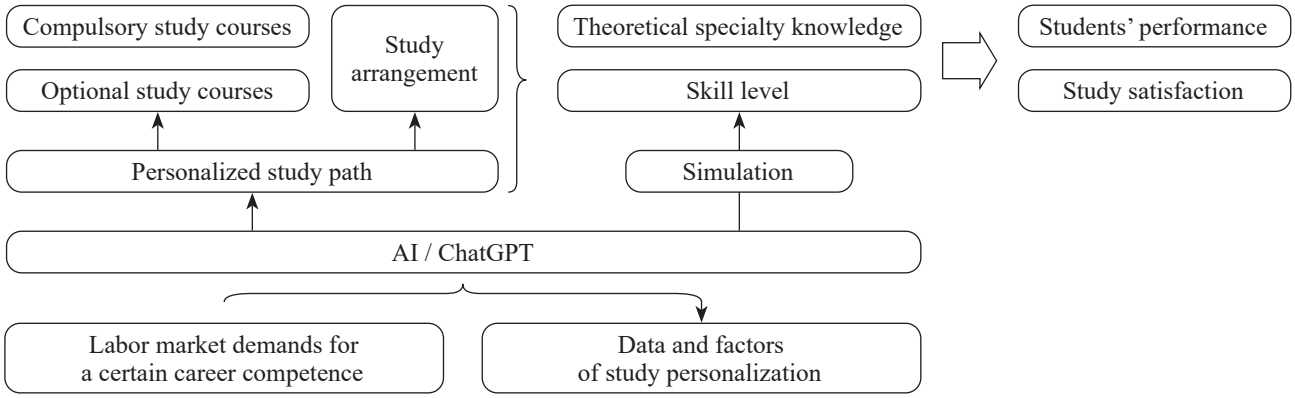

Figure 1. Model of AI and ChatGPT use for study personalization

Table 4

The SWOT analysis of AI integration into study personalization

Strengths	Weaknesses
1. Study adaptation to students' individual needs to personalize experience 2. Quick and effective feedback as well as assessment 3. Increased attraction and motivation of students via interactive content 4. Resource optimization (time, materials, etc.)	1. High implementation cost 2. Risk of dependence on technologies, low skills of critical thinking 3. Staff resistance to innovations 4. Need for additional staff and students' training to use AI tools
Opportunities	**Threats**
1. Higher digital competence 2. Better access to education for students with special study needs 3. New teaching approaches and methods that correspond to modern AI conditions 4. Improved educational quality based on inclusion of students' needs	1. Data privacy and security problems 2. Ethical dilemmas that can affect equal study opportunities 3. Isolation through overuse of digital technologies, influence on social skills 4. Potential fall of intellectual and emotional development among students

Table 5

AI integration strategies for study personalization in higher education

SO strategies	ST strategies
S1O1. The high-level strategy of study personalization S1O2. The strategy of educational product diversification as to special study needs S1O3. The strategy of educational chat bot development S1O4. The 50:50 strategy (50 % – communication with AI tutors, 50 % – communication with traditional lecturers) S2O1. The strategy of systemic AI integration into education S2O2. The strategy of individual AI courses S2O3. The AI-based strategy of students' performance enhancement S2O4. The AI-based strategy of students' satisfaction with study S3O1. The high-level strategy of study personalization S3O2. The strategy of individual AI courses S3O3. The strategy of AI tutors' development S3O4. The strategy of individual AI courses S4O1. The medium-level strategy of study personalization S4O2. The strategy of educational product diversification as to special study needs S4O3. The strategy of educational chat bot development S4O4. The AI-based strategy of students' performance enhancement	S1T1. The strategy of educational chat bot development S1T2. The low-level strategy of study personalization S1T3. The 50:50 strategy (50 % – communication with AI tutors, 50 % – communication with traditional lecturers) S1T4. The strategy of individual AI courses S2T1. The medium-level strategy of study personalization S2T2. The strategy of individual AI courses S2T3. The medium-level strategy of study personalization S2T4. The strategy of individual AI courses S3T1. The medium-level strategy of study personalization S3T2. The 50:50 strategy (50 % – communication with AI tutors, 50 % – communication with traditional lecturers) S3T3. The low-level strategy of study personalization S3T4. The low-level strategy of study personalization S4T1. The strategy of partnership with technology companies S4T2. The strategy of educational chat bot development S4T3. The low-level strategy of study personalization S4T4. The strategy of educational chat bot development
WO strategies	**WT strategies**
W1O1. The strategy of partnership with technology companies W1O2. The low-level strategy of study personalization W1O3. The strategy of educational chat bot development W1O4. The strategy of individual AI courses W2O1. The 50:50 strategy (50 % – communication with AI tutors, 50 % – communication with traditional lecturers) W2O2. The strategy of individual AI courses W2O3. The strategy of educational product diversification as to special study needs W2O4. The medium-level strategy of study personalization W3O1. The strategy of systemic AI integration into education W3O2. The strategy of educational product diversification as to special study needs W3O3. The strategy of individual AI courses W3O4. The medium-level strategy of study personalization W4O1. The strategy of partnership with technology companies W4O2. The strategy of educational product diversification as to special study needs W4O3. The strategy of AI tutor development W4O4. The strategy of systemic AI integration into education	W1T1. The low-level strategy of study personalization W1T2. The strategy of partnership with technology companies W1T3. The strategy of individual AI courses W1T4. The strategy of individual AI courses W2T1. The low-level strategy of study personalization W2T2. The strategy of individual AI courses W2T3. The low-level strategy of study personalization W2T4. The low-level strategy of study personalization W3T1. The strategy of individual AI courses W3T2. The strategy of individual AI courses W3T3. The strategy of individual AI courses W3T4. The strategy of individual AI courses W4T1. The strategy of partnership with technology companies W4T2. The medium-level strategy of study personalization W4T3. The strategy of individual AI courses W4T4. The strategy of individual AI courses

– the low-level strategy of study personalization. A basic personalization is employed: task difficulty adaptation and additional resource use depending on general students' performance. AI tools include minimum data for slight study correction. Such a strategy does not require significant costs and ensures normal study personalization without considerable change of educational institution infrastructure.

2. By methods of interaction with students:

– the strategy of educational chat bot development. AI-based chat bots assist students in solving tasks with a basic educational support. Such bots provide instant round-the-clock responses, which makes them available and convenient for students. This strategy can release human resources to fulfil more difficult tasks;

– the strategy of AI tutors' development. Virtual AI-based tutors accompany the study process. They imitate study experience and adapt teaching to individual students' desires;

– the 50:50 strategy (50 % – communication with AI tutors, 50 % – communication with traditional lecturers). Virtual AI study is combined with class or online study. On the one hand, students work with AI

tutors. On the other hand, they talk to lecturers and process learning materials.

3. By AI application scope:

– the strategy of systemic AI integration into education. AI is included in all spheres of educational institution work. Such a complex approach enhances study performance. Here, great investment and change management are required. However, they can transform the educational institution;

– the strategy of individual AI courses. AI tools are used in certain courses or programs for pilot testing and further improving. It can conduct special-purpose changes in study courses and keep strong feedback;

– the strategy of partnership with technology companies. Universities cooperate with technology companies for access to AI advanced tools. Institutions may get resources and support for AI integration from other sources. In other words, this strategy means the external investment use without the resource institution load.

4. By AI integration goals:

– the AI-based strategy of students' performance enhancement. AI analyzes performance data and detect study spheres with a deep focus. Special-purpose corrections of study paths provide better performance among students. This strategy aims at maximum academic achievements;

– the AI-based strategy of students' satisfaction with study. It improves students' experience to provide timely support, personalized study paths and interesting content. The strategy makes study more convenient and suitable for individual needs. It focuses on qualitative education aspects (like students' study attraction and mental health);

– the strategy of educational product diversification as to special study needs. AI tools create educational products to conform to students' preferences and learning requirements. Special AI tools for different courses, skills and study styles are defined.

Thus, higher education institutions must select the AI integration strategy to personalize study depending on the main goal of education transformation.

Conclusions from these problems and prospects for further research in this area. There are many advantages of AI integration into higher education: automated assessment, performance analysis, immediate feedback, equal study opportunities, study motivation development, time saving, etc.

To recommend AI integration into higher education, it is necessary to define potential study threats. Recognized by international acts, basic AI use principles are transparency and clarity, data privacy, accountability, anthropocentrism, inclusive and sustainable development, welfare.

To personalize education, the AI and ChatGPT use model consists of three interrelated units: study process, AI integration, study results. The first unit comprises compulsory and optional courses, their arrangement. The second unit integrates AI for education adjustment to individual needs of students as to their personal features and labor market demands. AI is also employed to simulate students' mastering professional and soft skills.

Another important model aspect is different strategies of study personalization. They vary from high personalization (full AI adaptation to students' needs) to basic personalization (minimum adaptation to students' needs). AI may be also integrated via educational chat bots or virtual tutors. It makes study more accessible, convenient and personalized without great costs.

The last unit is study results: theoretical knowledge and skill levels. Various AI integration strategies focus on performance increase, students' satisfaction or development of specific educational products. Strategies are selected as to educational transformation goals and readiness for latest technology implementation.

Further research will test the AI and ChatGPT use model for personalized education. Also, its respective integration strategies in higher education institutions will be tested as well.

REFERENCES

1. Chegg.org (2023) *Global Student Survey 2023*. Available at: https://8dfb1bf9-2f43-45af-abce-2877b9157e2c.usrfiles.com/ugd/8dfb1b_e9bad0aef091478397e6a9ff96651f6d.pdf (accessed July 09, 2024)

2. Rui D. (2023) Surge in Chinese Students Using AI for Academic Edge: New Survey. *Sixth Tone*. Available at: https://www.sixthtone.com/news/1014132 (accessed July 09, 2024)

3. von Garrel J., & Mayer J. (2023) Artificial Intelligence in studies—use of ChatGPT and AI-based tools among students in Germany. *Humanities and Social Sciences Communications*, vol. 10(799). Available at: https://doi.org/10.1057/s41599-023-02304-7 (accessed July 09, 2024)

4. Neves J., Freeman J., Stephenson R., Sotiropoulou D. P. (2024) Student Academic Experience Survey 2024. *Advance HE, HEPI*. Available at: https://s3.eu-west-2.amazonaws.com/assets.creode.advancehe-document-manager/documents/advance-he/Student%20Academic%20Experience%20Survey%202024_1718100686.pdf (accessed July 10, 2024)

5. Digital Care (2023) Wyniki badania: "Technologia okiem studenta" – jak korzysta z elektroniki oraz AI? *Focus On Business*. Available at: https://focusonbusiness.eu/pl/wiadomosci/wyniki-badania-technologia-okiem-studenta-jak-korzysta-z-elektroniki-oraz-ai/30494 (accessed July 10, 2024)

6. Compilatio, Le Sphinx polling institute (2023) Press release Nov. 2023 – Survey results: lecturers and students confront their views on AI. *Compilatio*. Available at: https://www.compilatio.net/en/blog/press-release-ai-survey-2023 (accessed July 11, 2024)

7. Samaieva Y. (2023) Stavlennia ukraintsiv do shtuchnoho intelektu na dyvo lehkovazhne. Darma [The attitude of Ukrainians toward artificial intelligence is surprisingly lighthearted. It's a shame]. *ZN.UA*. Available at: https://zn.ua/ukr/TECHNOLOGIES/stavlennja-ukrajintsiv-do-shtuchnoho-intelektu-na-divo-lehkovazhne-darma.html (accessed July 12, 2024)

8. Kaminskyi B. (2024) Chy vidbere ShI robotu u maibutnikh aitivtsiv: opytuvannia EPAM University [Will AI take away jobs from future IT professionals: EPAM University survey]. *Speka*. Available at: https://speka.media/ci-vidbere-si-robotu-u-maibutnix-aitivciv-opituvannya-eram-university-vzddzg (accessed July 12, 2024)

9. Bloom B. S. (1984) The 2 Sigma Problem: The Search for Methods of Group Instruction as Effective as One-to-One Tutoring. *Educational Researcher*, vol. 13(6), pp. 4–16. Available at: https://web.mit.edu/5.95/www/readings/bloom-two-sigma.pdf (accessed April 29, 2024)

10. Shemshack A., & Spector J. M. (2020) A systematic literature review of personalized learning terms. *Smart Learning Environments*, vol. 7(33), pp 1–20. DOI: https://doi.org/10.1186/s40561-020-00140-9 (accessed April 29, 2024).

11. Tkachuk H. V. (2021) Model realizatsii personalizovanoho navchannia studentiv zakladu vyshchoi osvity [Model of realization of personalized learning of students of higher education institution]. *Engineering and Educational Technologies*, vol. 9(3), pp. 8–17. Available at: https://dspace.udpu.edu.ua/bitstream/123456789/14222/1/EETECS2021_009(3)_001.pdf (accessed April 29, 2024).

12. Chemerys O. A., & Kibenko L. M. (2024) Personalizatsiia navchannia yak umova pidvyshchennia yakosti profesiinoi pidhotovky [Personalization of training as a condition for improving the quality of professional training]. *Naukovi doslidzhennia ta metodyka yikh provedennia: svitovyi dosvid ta vitchyzniani realii – 2024*: VII Mizhnarodna naukovo-praktychna konferentsiia (Vinnytsia, Vienna, March 15th, 2024). Vinnytsia: Grail of Science, pp. 385–387. DOI: https://doi.org/10.36074/grail-of-science.15.03.2024.062 (accessed May 02, 2024)

13. Quandeng G. (2022) Pereosmyslennia personalizovanoi modeli navchannia [Rethinking the personalized learning model]. *Akademichni studii. Seriia «Pedahohika» – Academic studies. Series "Pedagogy"*, vol. 4(17), pp. 117–121. DOI: https://doi.org/10.52726/as.pedagogy/2022.4.17 (accessed May 02, 2024)

14. Korchova H. (2022) Personalizovane navchannia yak naukovo-metodychna problema u profesiinii osviti [Personalized learning as scientific and methodological problem in professional education]. *Visnyk Kremenchutskoho natsionalnoho universytetu imeni Mykhaila Ostrohradskoho – Bulletin of the Kremenchug National University named after Mikhail Ostrogradsky*, vol. 5(8), pp. 61–65. DOI: https://doi.org/10.32782/1995-0519.2022.5.8 (accessed May 02, 2024)

15. Aslan A., Bakir I., & Vis I. F. A. (2020) A Dynamic Thompson Sampling Hyper-Heuristic Framework for Learning Activity Planning in Personalized Learning. European Journal of Operational Research, vol. 286(2), pp. 673–688. DOI: http://dx.doi.org/10.1016/j.ejor.2020.03.038 (accessed May 02, 2024)

16. Digital Defynd (2024) Personalized Learning vs Traditional Learning. Available at: https://digitaldefynd.com/IQ/personalized-learning-vs-traditional-learning/ (accessed July 12, 2024)

17. Felder R. M., & Silverman L. (1988) Learning and Teaching Styles in Engineering Education. *Journal of Engineering Education*, vol. 78 (7), pp. 674–681. Available at: https://www.researchgate.net/publication/257431200_Learning_and_Teaching_Styles_in_Engineering_Education (accessed April 21, 2024)

18. King M. R. N., Rothberg S. J., Dawson R. J., & Batmaz F. (2016) Bridging the edtech evidence gap: A realist evaluation framework refined for complex technology initiatives. *Journal of Systems and Information Technology*, vol. 18(1), pp. 18–40. DOI: https://doi.org/10.1108/JSIT-06-2015-0059 (accessed July 08, 2024)

19. Sosa-Diaz M. J., Sierra-Daza M. C., Arriazu-Muñoz R., Llamas-Salguero F., & Duran-Rodriguez N. (2022) "EdTech Integration Framework in Schools": Systematic Review of the Literature. *Frontiers Education*, vol. 7(895042), pp. 1–14. DOI: https://doi.org/10.3389/feduc.2022.895042 (accessed July 08, 2024)

20. Januszewski A., & Molenda M. (2007) *Educational Technology: A Definition with Commentary* (2nd. ed.). New York, Oxford: Routledge, p. 384. Available at: https://books.google.com.ua/books?id=0KnYIgZfxRwC&printsec=frontcover&hl=uk#v=onepage&q&f=false (accessed July 08, 2024)

21. Corbeil J. R., & Corbeil M. E. (2013) What do educational technologists do? The discipline as defined by educational technology practitioners. *Issues in Information Systems*, vol. 14(2), pp. 336–345. DOI: https://doi.org/10.48009/2_iis_2013_336-345 (accessed July 08, 2024)

22. Tymoshchuk T. Geniusee (2022) *Education Technology: A Complete Guide to EdTech.* Available at: https://geniusee.com/single-blog/education-technology-a-complete-guide-to-edtech (accessed May 11, 2024)

23. Raja R., & Nagasubramani P. C. (2018) Impact of modern technology in education. *Journal of Applied and Advanced Research*, vol. 3(1), pp. 33–35. DOI: https://doi.org/10.21839/jaar.2018.v3is1.165 (accessed May 10, 2024)

24. Herold B. (2016) Technology in Education: An Overview. *Education Week.* Available at: https://www.edweek.org/technology/technology-in-education-an-overview/2016/02 (accessed May 16, 2024)

25. Schmid R., Pauli C., Stebler R., Reusser K., & Petko D. (2022) Implementation of technology-supported personalized learning–its impact on instructional quality. *The Journal of Educational Research*, vol. 115(3), pp. 187–198. Available at: https://doi.org/10.1080/00220671.2022.2089086 (accessed May 17, 2024)

26. Major L., Francis G. A., & Tsapali M. (2021) The effectiveness of technology-supported personalised learning in low- and middle-income countries: A meta-analysis. *British Journal of Educational Technology*, vol. 52(5), pp. 1935–1964. Available at: https://doi.org/10.1111/bjet.13116 (accessed May 10, 2024)

27. Bartolomé A., Castañeda L., & Adell J. (2018) Personalisation in educational technology: the absence of underlying pedagogies. *International Journal of Educational Technology in Higher Education*, vol. 15(14), pp. 1–17. DOI: https://doi.org/10.1186/s41239-018-0095-0 (accessed May 11, 2024)

28. Maher J. K. O. J. (2023) Personalized learning through AI. *Advances in Engineering Innovation*, vol. 5(1), pp. 16–19. DOI: http://dx.doi.org/10.54254/2977-3903/5/2023039 (accessed July 09, 2024)

29. Chen L. (2021) Application of Artificial Intelligence Technology in Personalized Online Teaching under the Background of Big Data. *Journal of Physics: Conference Series*, vol. 1744(4), pp. 1–6. DOI: http://dx.doi.org/10.1088/1742-6596/1744/4/042208 (accessed July 09, 2024)

30. Ayeni O. O., Hamad N. M. A., Chisom O. N., Blessing O., & Adewusi O. E. (2024) AI in education: A review of personalized learning and educational technology. *GSC Advanced Research and Reviews*, vol. 18(2), pp. 261–271. DOI: https://doi.org/10.30574/gscarr.2024.18.2.0062 (accessed July 09, 2024)

31. Tapalova O., & Zhiyenbayeva N. (2022) Artificial Intelligence in Education: AIEd for Personalised Learning Pathways. *The Electronic Journal of e-Learning*, vol. 20(5), pp. 639–653. DOI: https://doi.org/10.34190/ejel.20.5.2597 (accessed July 09, 2024)

32. Fitria T. N. (2021). Artificial intelligence (AI) in education: using AI tools for teaching and learning process. *Prosiding Seminar Nasional & Call for Paper STIE AAS*, vol. 4(1), pp. 134–147. Available at: https://prosiding.stie-aas.ac.id/index.php/prosenas/article/view/106 (accessed July 11, 2024)

33. Murtaza M., Ahmed Y., Shamsi J. A., Sherwani F., & Usman M. (2022) AI-Based Personalized E-Learning Systems: Issues, Challenges, and Solutions. *IEEE Access*, vol. 10, pp. 81323–81342. DOI: https://doi.org/10.1109/ACCESS.2022.3193938 (accessed July 11, 2024)

34. Pratama M. P., Sampelolo R., Lura H. (2023) Revolutionizing education: harnessing the power of artificial intelligence for personalized learning. *Klasikal: Journal of Education, Language Teaching and Science*, vol. 5(2), pp. 350–357. DOI: https://doi.org/10.52208/klasikal.v5i2.877 (accessed July 11, 2024)

35. Demianenko V. M. (2020) Model adaptyvnoi navchalnoi systemy informatsiinoho prostoru vidkrytoi osvity [The model for adaptive learning systems of open education information environment]. *Informatsiini tekhnolohii i zasoby navchannia – Information technologies and learning tools*, vol. 77(3), pp. 27–38. DOI: http://dx.doi.org/10.33407/itlt.v77i3.3603 (accessed July 11, 2024)

36. Viznyuk I. M., Buhlai N. M., Kutsak L. V., Polishchuk A. S., & Kylyvnyk V. V. (2021) Vykorystannia shtuchnoho intelektu v osviti [Use of artificial intelligence in education]. *Suchasni informatsiini tekhnolohii ta innovatsiini metodyky navchannia v pidhotovtsi fakhivtsiv:metodolohiia, teoriia, dosvid, problem – Modern Information Technologies and Innovation Methodologies of Education in Professional Training Methodology Theory Experience Problems*, vol. 59(1), pp. 14–22. DOI: https://doi.org/10.31652/2412-1142-2021-59-14-22 (accessed July 11, 2024)

37. Kilchenko A. V. (2023) Rol tekhnolohii shtuchnoho intelektu u naukovo-pedahohichnii diialnosti osvitnikh zakladiv The Role of Artificial Intelligence [Technologies in the scientific and pedagogical activities of educational institutions]. *Tsyfrova osvita: suchasni realii ta perspektyvy rozvytku – 2023*: Materialy Vseukrainskoi naukovo-praktychnoi konferentsii (Zaporizhzhia, October 26th, 2023). Zaporizhzhia: Zaporizhzhia Regional Institute of Postgraduate Pedagogical Education, pp. 1–9. Available at: https://lib.iitta.gov.ua/id/eprint/737700/1/%D0%9A%D1%96%D0%BB%D1%8C%D1%87%D0%B5%D0%BD%D0%BA%D0%BE%20%D0%90.%D0%92._%D1%82%D0%B5%D0%B7%D0%B8_%D0%97%D0%B0%D0%BF%D0%BE%D1%80%D1%96%D0%B6%D0%B6%D1%8F.pdf (accessed July 12, 2024)

38. Ali L., Sorrentino C., Martiniello L. (2023) Personalized learning in the era of digital learning and artificial intelligence: futuristic perspectives and challenges. *Giornale Italiano di Educazione alla Salute, Sport eDidattica Inclusiva – Italian Journal of Health Education, Sports and Inclusive Didactics*, vol. 7(1), pp. 1–20. DOI: http://dx.doi.org/10.32043/gsd.v7i1.856 (accessed July 12, 2024)

39. Drach, I., Petroye, O., Borodiyenko, O., Reheilo, I., Bazeliuk, O., Bazeliuk, N., & Slobodianiuk, O. (2023) Vykorystannia shtuchnoho intelektu u vyshchii osviti [The Use of Artificial Intelligence in Higher Education]. *Mizhnarodnyi naukovyi zhurnal "Universytety i liderstvo" – International Scientific Journal of Universities and Leadership*, vol. 15, pp. 66–82. DOI: https://doi.org/10.31874/2520-6702-2023-15-66-82 (accessed March 29, 2024)

40. Foltynek T., Bjelobaba S., Glendinning I., Khan Z. R., Santos R., Pavletic P., & Kravjar J. (2023) ENAI Recommendations on the ethical use of Artificial Intelligence in Education. *International Journal for Educational Integrity*, vol. 19(12). DOI: https://doi.org/10.1007/s40979-023-00133-4 (accessed April 12, 2024)

41. Chiu T. K. F., Xia, Q., Zhou X., Chai C. S., & Cheng M. (2023) Systematic literature review on opportunities, challenges, and future research recommendations of artificial intelligence in education. *Computers and Education: Artificial Intelligence*, vol. 4(100118), pp. 1–15. DOI: https://doi.org/10.1016/j.caeai.2022.100118 (accessed April 16, 2024)

42. Chan C. K.Y. (2023) A comprehensive AI policy education framework for university teaching and learning. *International Journal of Educational Technology in Higher Education*, vol. 20(38), pp. 1–25. DOI: https://doi.org/10.1186/s41239-023-00408-3 (accessed April 13, 2024)

43. Cardona M. A., Rodríguez R. J., & Ishmael K. (2023) *Artificial Intelligence and the Future of Teaching and Learning*. Washington: The U.S. Department of Education Office of Educational Technology's, 67 p. Available at: https://tech.ed.gov/ai-future-of-teaching-and-learning/?trk=article-ssr-frontend-pulse_little-text-block (accessed April 02, 2024)

44. Marienko M., & Kovalenko V. (2023) Shtuchnyi intelekt ta vidkryta nauka v osviti [Artificial intelligence and open science in education]. *Fizyko-matematychna osvita – Physical and Mathematical Education*, vol. 38(1), pp. 48–53. DOI: https://doi.org/10.31110/2413-1571-2023-038-1-007 (accessed April 11, 2024)

45. Velibor B., & Indrasen P. (2023) Chat GPT and education. Pp. 1–8. DOI: https://doi.org/10.13140/RG.2.2.18837.40168 (accessed April 04, 2024)

46. Ushakova I. O., & Pedan O. A. (2020) Osoblyvosti vykorystannia shtuchnoho intelektu v osviti [Features of the use of artificial intelligence in education]. *Informatsiini tekhnolohii ta systemy – 2020*: Mizhnarodna naukovo-praktichna

konferenciya (Kharkiv, April 9th-10th, 2020). Kharkiv: Simon Kuznets Kharkiv National University of Economics, p. 31. Available at: https://it.hneu.edu.ua/wp-content/uploads/2021/10/tezy-dopovidej-mizhnarodnoyi-naukovo-praktychnoyi-konferenczyi-informaczijni-tehnologiyi-ta-systemy-2020.pdf#page=31 (accessed March 14, 2024)

47. Sullivan M., Kelly A., & McLaughlan P. (2023) ChatGPT in higher education: Considerations for academic integrity and student learning. *Journal of Applied Learning & Teaching*, vol. 6(1), pp. 31–40. DOI: https://doi.org/10.37074/jalt.2023.6.1.17 (accessed April 04, 2024)

48. Palamar S., & Naumenko M. (2024) Shtuchnyi intelekt v osviti: vykorystannia bez porushennia pryntsypiv akademichnoi chesnosti [Artificial Intelligence in Education: Use Without Violating the Principles of Academic Integrity]. *Osvitolohichnyi dyskurs – Educational discourse*, vol. 1(44), pp. 68–83. DOI: https://doi.org/10.28925/2312-5829.2024.15 (accessed April 13, 2024)

49. Berdo R. S., Rasiun V. L., & Velychko V. A. (2023) Shtuchnyi intelekt ta yoho vplyv na etychni aspekty naukovykh doslidzhen v ukrainskykh zakladakh osvity [Artificial intelligence and its impact on ethical aspects of scientific research in Ukrainian educational institutions]. *Akademichni vizii – Academic visions*, vol. 22, pp. 1–10. DOI: https://doi.org/10.5281/zenodo.8174388 (accessed March 10, 2024)

50. Kulieshov S. O. (2023) Vplyv shtuchnoho intelektu na vyshchu osvitu Spoluchenykh Shtativ Ameryky [The impact of artificial intelligence on US higher education]. *Tekhnolohii dobrochesnoho vykorystannia shtuchnoho intelektu u sferi osvity ta nauky – 2023*: Vseukrainske naukovo-pedahohichne pidvyshchennia kvalifikatsii (Poltava, July 31st – September 10th, 2023). Odesa: Helvetyka, pp. 152–153. Available at: https://www.researchgate.net/profile/Nataliia-Furmanova/publication/377444350_VIKORISTANNA_STUCNOGO_INTELEKTU_DLA_PIDGOTOVKI_DO_ZANAT_NA_PRIKLADI_CHATGPT/links/65a7ab3dcc780a4b19c0019a/VIKORISTANNA-STUCNOGO-INTELEKTU-DLA-PIDGOTOVKI-DO-ZANAT-NA-PRIKLADI-CHATGPT.pdf#page=126 (accessed March 21, 2024)

51. Köbis L., & Mehner C. (2021) Ethical Questions Raised by AI-Supported Mentoring in Higher Education. *Frontiers in Artificial Intelligence*, vol. 4, pp. 1–9. DOI: https://doi.org/10.3389/frai.2021.624050 (accessed April 12, 2024)

52. Spivakovsky O. V., Omelchuk S. A., Kobets V. V., Valko N. V., & Malchykova D. S. (2023) Institutional policies on artificial intelligence in university learning, teaching and research. *Information Technologies and Learning Tools*, vol. 97(5), pp. 181–202. DOI: https://doi.org/10.33407/itlt.v97i5.5395 (accessed April 16, 2024)

53. Panukhnyk O. V. Shtuchnyi intelekt v osvitnomu protsesi ta naukovykh doslidzhenniakh zdobuvachiv vyshchoi osvity: vidpovidalni mezhi vmistu shtuchnoho intelektu [Artificial intelligence in the educational process and scientific research of higher education applicants: responsible boundaries of AI content]. *Halytskyi ekonomichnyi visnyk – Galician economic journal*, vol. 83(4), pp. 202–211. DOI: https://doi.org/10.33108/galicianvisnyk_tntu2023.04.202 (accessed March 09, 2024)

54. Bakhmat N. V. (2023) Shtuchnyi intelekt u vyshchii osviti: mozhlyvosti vykorystannia [Artificial intelligence in higher education: possibilities of using]. *Pedahohichna osvita: teoriia i praktyka – Pedagogical Education: Theory and Practice*, vol. 2(35), pp. 161–173. DOI: https://doi.org/10.32626/2309-9763.2023-161-173 (accessed April 12, 2024)

55. Jungherr A. (2023) *Using ChatGPT and Other Large Language Model (LLM) Applications for Academic Paper Assignments*. Bamberg: Otto-Friedrich-Universität, 48 p. Available at: https://nbn-resolving.org/urn:nbn:de:bvb:473-irb-589507 (accessed April 01, 2024)

56. Jürgen R., Samson T., & Shannon T. (2023) ChatGPT: Bullshit spewer or the end of traditional assessments in higher education?. *Journal of Applied Learning & Teaching*, vol. 6(1), pp. 342–363. DOI: https://doi.org/10.37074/jalt.2023.6.1.9 (accessed April 16, 2024)

57. Sodel O. (2023) Potentsial shtuchnoho intelektu u vyshchii osviti [The potential of AI in higher education]. *Natsionalnyi universytet bioresursiv i pryrodokorystuvannia Ukrainy – National University of Life and Environmental Sciences of Ukraine*. Available at: https://nubip.edu.ua/node/126807 (accessed March 16, 2024)

58. Mötteli C., Reusser K., Grob U., & Pauli C. (2023) The influence of personalized learning on the development of learning enjoyment. *International Journal of Educational Research Open*, vol. 5(100271), pp. 1–10. DOI: https://doi.org/10.1016/j.ijedro.2023.100271 (accessed July 14, 2024)

59. Dumont H., & Ready D. D. (2023) On the promise of personalized learning for educational equity. *NPJ Sci Learn*, vol. 8(26). DOI: https://doi.org/10.1038%2Fs41539-023-00174-x (accessed July 15, 2024)

60. Bruce F., Patrick S., Schneider C., & Ark T. V. (2017) *What's Possible with Personalized Learning? An Overview of Personalized Learning for Schools, Families & Communities*. Vienna, VA: International Association for K-12 Online Learning (iNACOL), p. 28. Available at: https://aurora-institute.org/wp-content/uploads/iNACOL_Whats-Possible-with-Personalized-Learning.pdf (accessed July 15, 2024)

61. Çullhaj Dr. S. (2017) Key Features of Personalized Learning. *European Journal of Multidisciplinary Studies*, vol. 2(7), pp. 130–132. Available at: https://revistia.com/files/articles/ejms_v2_i7_17/Salian.pdf (accessed July 15, 2024)

62. Pane J. F., Steiner E. D., Baird M. D., & Hamilton L. S. (2015) *Continued Progress: Promising Evidence on Personalized Learning*. Santa Monica, CA: RAND Corporation, p. 52. Available at: https://www.rand.org/pubs/research_reports/RR1365.html (accessed July 15, 2024)

63. Johns S., Wolking M. (2018) *The Core Four of Personalized Learning: The Elements You Need to Succeed*. South San Francisco, California: Education Elements, p. 25. Available at: https://www.edelements.com/hubfs/Core_Four/Education_Elements_Core_Four_White_Paper.pdf (accessed July 15, 2024)

64. Yuyun I., & Suherdi D. (2023) Components and Strategies for Personalized Learning in Higher Education: A Systematic Review. *ASIATEFL 2022, ASSEHR*, vol. 749*,* pp. 271–290. DOI: http://dx.doi.org/10.2991/978-2-38476-054-1_23 (accessed July 15, 2024)

65. Hanover Research (2014) *Best Practices in Personalized Learning Implementation*. Arlington, VA: Hanover Research, p. 34. Available at: https://www.hanoverresearch.com/media/Best-Practices-in-Personalized-Learning-Implementation.pdf (accessed July 15, 2024)

66. Younas A., Subramanian K. P., Al-Haziazi M., Hussainy S. S., & Kindi A. N. S. A. (2023) A Review on Implementation of Artificial Intelligence in Education. *International Journal of Research and Innovation in Social Science*, vol. 7(8), pp. 1092–1100. DOI: https://doi.org/10.47772/ijriss.2023.7886 (accessed May 16, 2024)

67. Lake K. (2023) How To Personalize Learning Using AI. *eLearning Industry*. Available at: https://elearningindustry.com/how-to-personalize-learning-using-ai (accessed May 16, 2024)

68. Data Overload (2024) Personalized Learning and Skill Enhancement: Unleashing the Potential of AI in Education. *Medium*. Available at: https://medium.com/@data-overload/personalized-learning-and-skill-enhancement-unleashing-the-potential-of-ai-in-education-9b1f6af14bbd (accessed May 09, 2024)

69. AI transforms education industry. *Data Science UA*. Available at: https://data-science-ua.com/industries/ai-in-education/#pll_switcher (accessed July 16, 2024)

70. Shashank J. (2023) The Role of Technology in Education, Post Pandemic. *eLearning Industry*. Available at: https://elearningindustry.com/the-role-of-technology-in-education-post-pandemic (accessed May 16, 2024)

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Анотація. *Штучний інтелект швидко імплементується в процеси навчання студентів впродовж 2022–2024 рр., як в Україні, так і в усьому світі, що визначає актуальність розроблення політик, правил, моделей його використання. Метою статті є побудова моделі використання штучного інтелекту та інструменту ChatGPT для персоналізації навчання у вищій освіті. Проаналізовано концепцію персоналізованого навчання. Систематизовано ознаки, які відрізняють персоналізовану освіту від традиційної. Виявлено, що персоналізоване навчання має гнучкий, інтерактивний та індивідуально-адаптивний характер. Впровадження ШІ дозволяє централізувати роль студента в освітній системі та адаптувати навчальний процес відповідно до його цілей, інтересів та потреб. Такий підхід сприяє підвищенню ефективності підготовки студента в якості майбутнього учасника ринку праці, одночасно забезпечуючи розвиток його соціально-психологічних якостей. Проаналізовано за допомогою бінарного методу оцінки вплив інструментів штучного інтелекту на персоналізацію навчання. Аргументовано вплив штучного інтелекту на персоналізацію навчання як середнього рівня (72,7% впливу). Доведено, що інструментарій штучного інтелекту задовольняє більшість основних потреб персоналізованого навчання. Запропоновано модель використання штучного інтелекту та ChatGPT для персоналізації навчання у вищій освіті, що складається з трьох взаємопов'язаних блоків: процес навчання, інтеграція ШІ та результати навчання. Сформовано основні групи стратегії персоналізації навчання (група стратегій за рівнем персоналізації навчання; група стратегій за методами взаємодії зі студентами; група стратегій за масштабом впровадження штучного інтелекту; група стратегій залежно від цілей впровадження штучного інтелекту). Стратегії інтеграції штучного інтелекту концентруються на підвищенні академічної успішності, задоволеності студентів, розробленні специфічних освітніх продуктів. Обґрунтування вибору стратегії імплементації штучного інтелекту в навчальний процес і освітнє середовище вищого навчального закладу визначається цілями трансформації освітнього процесу та готовності до впровадження новітніх технологій.*

Ключові слова: *бінарна оцінка, вища освіта, ефективність, модель, персоналізоване навчання, результати навчання, стратегія, технологія, штучний інтелект, ChatGPT, SWOT-аналіз.*