МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ

НАУКОВИЙ ВІСНИК

МУКАЧІВСЬКОГО ДЕРЖАВНОГО УНІВЕРСИТЕТУ

СЕРІЯ «ПЕДАГОГІКА ТА ПСИХОЛОГІЯ»

Науковий журнал

ТОМ 12, № 2
2026

МУКАЧЕВО
2026

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE

SCIENTIFIC BULLETIN

OF MUKACHEVO STATE UNIVERSITY

SERIES "PEDAGOGY AND PSYCHOLOGY"

Scientific Journal

VOL. 12, No. 2
2026

MUKACHEVO
2026

ISSN 2413-3329
E-ISSN 2520-6788

Засновник та видавець:
Мукачівський державний університет

Рік заснування: 2015
Періодичність випуску: щоквартально

Рекомендовано до друку та поширення через мережу «Інтернет» Вченою радою Мукачівського державного університету (протокол № 12 від 25 травня 2026 р.)

Ідентифікатор медіа: R30-04570
(Рішення Національної ради України з питань телебачення і радіомовлення № 1564, протокол № 15 від 9 травня 2024 р.)

Журнал включено до Переліку наукових фахових видань України (Категорія «Б»)
A1 Освітні науки; A2 Дошкільна освіта; A3 Початкова освіта; A4 Середня освіта (за предметними спеціальностями); A5 Професійна освіта (за спеціалізаціями); A6 Спеціальна освіта (за спеціалізаціями); C4 Психологія

(Наказ Міністерства освіти і науки України № 928 від 11.06.2026)

Кластер: Розвиток людського капіталу, соціальні науки та журналістика

Журнал представлено в таких наукометричних базах даних, репозитаріях та пошукових системах:
Google Академія, Gale, Фахові видання України, Національна бібліотека України імені В.І. Вернадського, CiteFactor, EBSCO, Scientific Journal Impact Factor (SJIF), UCSB Library, ERIH PLUS, Dimensions, Polska Bibliografia Naukowa (PBN), German Union Catalogue of Serials (ZDB), Leipzig University Library, University of Oslo Library, University of Hull Library, Search Oxford Libraries Online (SOLO), European University Institute (EUI), Cambridge University Library, Crossref, Naver Academic, Open Ukrainian Citation Index (OUCI), Worldcat, CORE, Litmaps

Науковий вісник Мукачівського державного університету. Серія «Педагогіка та психологія» / Ред. кол.: Н. Цибуляк та ін. Мукачево : Вид-во МДУ, 2026. Т. 12, № 2. 103 с.

Адреса редакції:
Мукачівський державний університет
89600, вул. Ужгородська, 26, м. Мукачево, Україна
Тел. +380 (31) 312-11-09
E-mail: info@pp-msu.com.ua
https://pp-msu.com.ua

ISSN 2413-3329
E-ISSN 2520-6788

Founder and publisher:
Mukachevo State University

Year of foundation: 2015
Frequency: quarterly

Recommended for printing and distribution via the Internet by the Academic Council of Mukachevo State University (Minutes No.12 of May 25, 2026)

Media identifier: R30-04570
(Decision of the National Council of Television and Radio Broadcasting of Ukraine No. 1564, Minutes No. 15 of May 9, 2024)

The journal is included in the List of professional scientific publications of Ukraine (Category "B")
0111 Education science; 0112 Training for pre-school teachers; 0113 Teacher training without subject specialisation; 0114 Teacher training with subject specialisation; 0313 Psychology

(Order of the Ministry of Education and Science of Ukraine No. 928 of 11.06.2026)

Journal: Human Capital Development, Social Sciences and Journalism

The journal is presented in the following scientometric databases:
Google Scholar, Gale, Professional Publications of Ukraine, Vernadsky National Library of Ukraine, CiteFactor, EBSCO, Scientific Journal Impact Factor (SJIF), UCSB Library, ERIH PLUS, Dimensions, Polska Bibliografia Naukowa (PBN), German Union Catalogue of Serials (ZDB), Leipzig University Library, University of Oslo Library, University of Hull Library, Search Oxford Libraries Online (SOLO), European University Institute (EUI), Cambridge University Library, Crossref, Naver Academic, Open Ukrainian Citation Index (OUCI), Worldcat, CORE, Litmaps

Scientific Bulletin of Mukachevo State University. Series "Pedagogy and Psychology" / Editorial Board: N. Tsybuliak *et al*. Mukachevo : MSU Publishing House, 2026. Vol. 12, No. 2. 103 p.

Editors office address:
Mukachevo State University
89600, 26 Uzhhorodska Str., Mukachevo, Ukraine
Tel. +380 (31) 312-11-09
E-mail: info@pp-msu.com.ua
https://pp-msu.com.ua/en

НАУКОВИЙ ВІСНИК МУКАЧІВСЬКОГО ДЕРЖАВНОГО УНІВЕРСИТЕТУ

СЕРІЯ «ПЕДАГОГІКА ТА ПСИХОЛОГІЯ»
Том 12, № 2, 2026

Головний редактор	**Наталя Цибуляк** – Кандидат психологічних наук, доцент, Бердянський державний педагогічний університет, Україна
Заступник головного редактора	**Оксана Попович** – Доктор педагогічних наук, професор, Мукачівський державний університет, Україна
Національні члени редколегії	
Інокентій Корнієнко	Доктор психологічних наук, професор, Мукачівський державний університет, Україна
Наталія Бахмат	Доктор педагогічних наук, професор, Кам'янець-Подільський національний університет імені Івана Огієнка, Україна
Тетяна Волошина	Кандидат педагогічних наук, доцент, Національний університет біоресурсів і природокористування України, Україна
Валентина Корольчук	Доктор філософії, доцент, Національний університет біоресурсів і природокористування України, Україна
Юліана Лавриш	Доктор педагогічних наук, професор, Національний технічний університет України «Київський політехнічний інститут імені Ігоря Сікорського», Україна
Віолетта Панченко	Кандидат педагогічних наук, доцент, Комунальний заклад «Харківська гуманітарно-педагогічна академія» Харківської обласної ради, Україна
Оксана Чекан	Кандидат педагогічних наук, доцент, Мукачівський державний університет, Україна
Маріанна Швардак	Доктор педагогічних наук, професор, Мукачівський державний університет, Україна
Ірина Брецко	Кандидат психологічних наук, доцент, Мукачівський державний університет, Україна
Софія Човрій	Кандидат педагогічних наук, доцент, Закарпатський угорський університет імені Ференца Ракоці II, Україна
Міжнародні члени редколегії	
Мілан Куб'ятко	Доктор філософії, Університет Яна Євангеліста в Усті-над-Лабем, Чеська Республіка
Марія Каміно	Кандидат наук з англійської філології, професор, Державний університет Наварри, Іспанія
Човк Цінтіо	Доктор філософії, ад'юнкт кафедри педагогічних наук, Дебреценський університет, Угорщина
Котінко Бочкоі	Доктор філософії, ад'юнкт кафедри педагогічних наук, Дебреценський університет, Угорщина

Editor-in-Chief	**Natalia Tsybuliak** – PhD in Psychology, Associate Professor, Berdyansk State Pedagogical University, Ukraine
Deputy Editor-in-Chief	**Oksana Popovych** – Doctor of Pedagogy, Professor, Mukachevo State University, Ukraine
National Members of the Editorial Board	
Inokentiy Kornienko	Doctor of Psychology, Professor, Mukachevo State University, Ukraine
Nataliia Bakhmat	Doctor of Pedagogy, Professor, Kamianets-Podilskyi Ivan Ohiienko National University, Ukraine
Tetyana Voloshyna	PhD in Pedagogy, Associate Professor, National University of Life and Environmental Sciences of Ukraine, Ukraine
Valentina Korolchuk	PhD, Associate Professor, National University of Life and Environmental Sciences of Ukraine, Ukraine
Juliana Lavrysh	Doctor of Pedagogy, Professor, National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute", Ukraine
Violetta Panchenko	PhD in Pedagogy, Associate Professor, Municipal Establishment "Kharkiv Humanitarian-Pedagogical Academy" of Kharkiv Regional Council, Ukraine
Oksana Chekan	PhD in Pedagogy, Associate Professor, Mukachevo State University, Ukraine
Marianna Shvardak	Doctor of Pedagogy, Professor, Mukachevo State University, Ukraine
Irina Bretsko	PhD in Psychology, Associate Professor, Mukachevo State University, Ukraine
Sofiya Chovriy	PhD in Pedagogy, Associate Professor, Ferenc Rákóczi II Transcarpathian Hungarian University, Ukraine
International Members of the Editorial Board	
Milan Kubiatko	PhD in Philosophy, University of Jan Evangelista in Ústí nad Labem, Czech Republic
María Camino	PhD in English Philology, Professor, University of Navarra, Spain
Cintia Csók	Doctor of Philosophy, Adjunct of the Department of Pedagogical Sciences, University of Debrecen, Hungary
Katinka Bacskai	Doctor of Philosophy, Adjunct of the Department of Pedagogical Sciences, University of Debrecen, Hungary

ЗМІСТ

ПЕДАГОГІКА

Ю. Шафорост, В. Шпак, А. Шафорост

Мейкерство як засіб реалізації едьютейнменту
у навчанні хімії учнів старшої школи 9

Ю. Євтушенко

Освітні технології формування етичної рефлексії майбутніх лікарів
у цифровому навчальному середовищі 20

А. Миколайчук

Педагогічний і технологічний виміри цифрової трансформації журналістської освіти 35

Л. Романовська, О. Кравчук, І. Варіс

Цифрове перевантаження та вигорання у вищій освіті 47

Н. Недвецька

Інтерактивні технології як сучасні засоби підготовки
викладача закладу вищої освіти до профорієнтаційної діяльності 65

М. Зембицька, А. Горошко

Розвиток граматичної усвідомленості засобами перекладу
в навчанні англійської мови як іноземної 75

ПСИХОЛОГІЯ

М. Тюганова, Ю. Маєр, А. Бархота

Психологічні особливості взаємозв'язку тривожності та емоційного вигорання 84

В. Джеджея, О. Зазимко

Емоційний ресурс як психологічний предиктор
критичного мислення особистості в цифровому суспільстві 92

CONTENTS

PEDAGOGY

Y. Shaforost, V. Shpak, A. Shaforost

Maker education as a means of implementing edutainment in the teaching of chemistry to upper secondary school pupils 9

Y. Yevtushenko

Educational technologies for developing ethical reflection in future doctors within a digital learning environment 20

A. Mykolaichuk

Digital transformation of journalism education through a pedagogical and technological lens 35

L. Romanovska, O. Kravchuk, I. Varis

Digital overload and burnout in higher education 47

N. Nedvetska

Interactive technologies as modern tools for preparing higher education lecturers for career guidance activities 65

M. Zembytska, A. Goroshko

Raising grammatical awareness through translation in the EFL classroom 75

PSYCHOLOGY

M. Tiuhanova, Yu. Maier, A. Barkhota

Psychological characteristics of the relationship between anxiety and emotional burnout 84

V. Dzhedzheia, O. Zazymko

Emotional resource as a psychological predictor of critical thinking in the digital society 92

UDC 378.147:54:371.3
DOI: 10.52534/msu-pp2.2026.09

ISSN 2413-3329
E-ISSN 2520-6788

Yuliia Shaforost*
PhD in Chemistry, Associate Professor
Bohdan Khmelnytsky National University of Cherkasy
18031, 81 Shevchenka Blvd., Cherkasy, Ukraine
https://orcid.org/0000-0002-0002-2803

Valentyna Shpak
Doctor of Pedagogy, Professor
Bohdan Khmelnytsky National University of Cherkasy
18031, 81 Shevchenka Blvd., Cherkasy, Ukraine
https://orcid.org/0000-0003-0913-6150

Andrii Shaforost
Student
Bohdan Khmelnytsky National University of Cherkasy
18031, 81 Shevchenka Blvd., Cherkasy, Ukraine
https://orcid.org/0009-0003-3027-554X

Maker education as a means of implementing edutainment in the teaching of chemistry to upper secondary school pupils

Article's History:
Received: 23.12.2025
Revised: 06.04.2026
Accepted: 25.05.2026
Published: 29.06.2026

Suggested Citation:
Shaforost, Yu., Shpak, V., & Shaforost, A. (2026). Maker education as a means of implementing edutainment in the teaching of chemistry to upper secondary school pupils. *Scientific Bulletin of Mukachevo State University. Series "Pedagogy and Psychology"*, 12(2), 9-19. doi: 10.52534/msu-pp2.2026.09.

*Corresponding author (zdoryulia@ukr.net)

Abstract. In the contemporary context of educational development, the use of innovative pedagogical approaches aimed at increasing learners' motivation and fostering their research and creative activity has become particularly important. One of the most promising directions is the integration of edutainment and maker education. The aim of this study was to substantiate and experimentally verify the effectiveness of the maker education approach as a means of implementing edutainment in the process of teaching chemistry to Year 11 pupils. A combination of theoretical and empirical methods was employed, including the analysis and synthesis of scientific and pedagogical literature, pedagogical modelling, classroom observation, questionnaires, interviews, and a pedagogical experiment. The results of the pedagogical experiment demonstrated that, at the initial stage, both groups were characterised predominantly by medium and low levels of cognitive activity. During the formative stage, pupils in the experimental class completed maker education tasks and mini-projects involving the construction of experimental models and the conduct of investigations. The implementation of these activities contributed to increased cognitive engagement and to the development of creativity and independence. Comparative analysis of the results obtained at the initial and final stages revealed a significant improvement in the level of cognitive activity among pupils in the experimental class: the proportion of pupils demonstrating a high level increased from 10% to 43%, while the proportion of those with a low level decreased from 43% to 9%. The findings confirmed the effectiveness of maker education tasks as a means of enhancing learning activity and increasing motivation to study chemistry. The practical value of the study lay in the development of a methodological model for organising maker education activities and a system of maker education tasks for chemistry teaching, which were tested by student teachers during their teaching practice

Keywords: motivation; cognitive activity; design; experimentation; STEM education

Copyright © The Author(s). This is an open access article distributed under the terms of the Creative Commons Attribution License 4.0 (https://creativecommons.org/licenses/by/4.0/)

INTRODUCTION

Contemporary educational development is characterised by the active implementation of innovative pedagogical approaches aimed at increasing learners' motivation and fostering the development of their research and creative skills. One such approach is edutainment, which combines educational activities with elements of interactivity, creativity, and practical engagement. Its use contributes to the creation of a learning environment in which the process of acquiring knowledge becomes more engaging, emotionally rich, and closely connected with real-life situations. Unlike traditional forms of instruction, edutainment focuses on the active participation of learners in cognitive activities through game-based technologies, project work, multimedia tools, experimentation, and collaborative interaction. Such an approach not only enhances interest in academic subjects but also promotes the development of critical thinking, communication skills, the ability to search for information independently, and its practical application. Edutainment is particularly relevant in the context of the digitalisation of education and the need to develop competences required for successful professional and social integration in contemporary society. In this regard, investigating the possibilities of integrating edutainment into the educational process represents an important direction for improving teaching methods and enhancing the quality of education.

T. Kucher (2021) analysed the principles and best practices for designing digital learning environments based on game technologies. The study synthesised approaches to the creation of game-based learning environments and demonstrated that their effectiveness depends on the combination of pedagogical design, interactivity, and the active involvement of learners. C. Steinkuehler (2023) examined games as social platforms for learning and interaction. The author emphasised that gaming environments facilitate community building, promote communication, and support informal learning through participant interaction. L.C. Brandl & A. Schrader (2024), in their systematic review, investigated the role of serious games in transforming education within the framework of Education 4.0. Their findings indicated that the use of serious games contributes to increased learner motivation and engagement. The authors stressed that the effectiveness of game-based approaches depends on their integration into pedagogical design and alignment with educational objectives rather than merely the presence of entertainment elements. M. Li *et al.* (2023), in a meta-analysis, explored the effectiveness of gamification in education. They found that the use of game elements positively influences learners' motivation, engagement, and academic performance, although the degree of effectiveness depends largely on the quality of pedagogical design. J.J. Ramírez-Ruiz *et al.* (2024), in a systematic review, investigated the impact of gamification on learner engagement. Their results showed that the use of game elements contributes to increased academic, emotional, and behavioural engagement in the learning process.

Contemporary studies also highlight the importance of employing innovative educational technologies in the teaching of science subjects, particularly chemistry, since interactive digital tools, simulations, and virtual laboratories contribute to a deeper understanding of complex scientific concepts and the development of twenty-first-century competences. V. Honcharuk *et al.* (2025) analysed the current state of implementing innovative pedagogical technologies within the system of science education in Ukraine. Y. Feldman-Maggor *et al.* (2025) investigated the possibilities of using generative artificial intelligence in chemistry education within the framework of the TPACK approach. Their study examined the potential for integrating technological tools into the educational process and emphasised their role in supporting teachers' pedagogical and subject-specific knowledge. V. Kolodii *et al.* (2025) developed interactive virtual laboratories for distance learning in science subjects. Their research demonstrated that the use of such laboratories promotes the development of practical skills and enhances the effectiveness of learning and understanding educational content.

One of the promising areas for implementing the activity-based approach in education is maker education, which involves learning through the creation of one's own products, experimentation and practical activities. Q. Ou & X. Chen (2024) investigated the content and structure of maker education programmes, taking into account the capabilities of artificial intelligence. The authors analysed the characteristics of organising maker-oriented learning and highlighted its importance for the development of creativity, innovative thinking and practical skills among learners. Considerable attention is also paid to integrating the maker approach into the training of future teachers. In particular, the results of recent studies indicate that the use of maker practices in teacher training contributes to the development of future teachers' professional competence, their creativity and their readiness to apply innovative teaching methods in school practice, as demonstrated in the work of L.B. Calheiro & I.M. Greca (2025).

At the same time, some recent studies indicate that the maker approach has a positive impact on pupils' motivation to study science, fosters an interest in STEM careers and boosts their confidence in their own learning abilities. Researchers K. Chen *et al.* (2024) investigated the integration of maker activities into the teaching of science subjects in formal school settings. The quasi-experimental study found that such integration helps to improve pupils' scientific self-efficacy and supports their motivation and interest in STEM fields. According to a study by O.A. Sorochynska *et al.* (2022), the introduction of STREAM education incorporating elements of maker activities in pre-school settings contributes to the development of children's research skills, creativity and the formation of their scientific and natural science competences. The maker movement is actively developing worldwide as a component of STEM and STEAM education, creating

conditions for the integration of science, technology, engineering, art and mathematics.

Despite the growing number of studies devoted to the use of edutainment and maker education in the teaching of natural science disciplines, the issue of applying the maker approach as a means of implementing edutainment in the methodological training of future chemistry teachers remains insufficiently explored. Thus, contemporary research confirms the effectiveness of game-based and maker approaches; however, the issue of their integration into the methodological training of chemistry teachers remains insufficiently explored. In particular, there is a lack of comprehensive studies aimed at combining maker activities with elements of edutainment in the context of chemistry teaching. The aim of the study was to theoretically substantiate and experimentally verify the effectiveness of the maker approach as a means of implementing edutainment in the study of chemistry by Year 11 pupils. Improvements in pupils' educational outcomes can be regarded as an indicator of the effectiveness of the methodological training of future chemistry teachers, as they reflect the effectiveness of the pedagogical technologies applied.

MATERIALS AND METHODS

The study was conducted at one of the secondary education institutions in Cherkasy between September 2024 and May 2025. The name of the school has not been disclosed in order to comply with confidentiality requirements and to protect the personal data of the study participants. A range of theoretical and empirical methods was employed during the study. A range of theoretical and empirical methods was employed during the study. The theoretical methods included the analysis, synthesis and generalisation of scientific and pedagogical sources on the topics of maker education, edutainment and chemistry teaching methodologies, as well as pedagogical modelling, which enabled the development of a system of maker tasks for chemistry lessons. The empirical methods included pedagogical observation, a questionnaire designed by the authors and a pedagogical experiment. The questionnaire for pupils was conducted offline at a general secondary school in Cherkasy during chemistry lessons. The survey was anonymous and voluntary. Pupils completed the questionnaires individually in written form. The questionnaire consisted of 10 closed-ended and semi-open-ended questions aimed at determining the level of cognitive activity, learning motivation, interest in the subject and awareness of the practical significance of chemistry.

The developed teaching materials were tested during the teaching placements of students specialising in 014 Secondary Education (Chemistry). Future teachers applied the developed maker tasks incorporating elements of edutainment whilst conducting chemistry lessons at the aforementioned school. The selection of topics from the school chemistry curriculum for implementing the maker approach was based on a combination of didactic and methodological criteria. The main selection criteria included: the possibility of organising practice-oriented activities involving the construction of models, conducting experiments and creating physical or functional objects; the availability of simple and safe materials suitable for use in a school laboratory or for home experiments; the presence of significant cross-curricular potential (STEM integration), in particular links to physics, biology and technology; the possibility of visualising and observing the results of activities, which is important for implementing the edutainment approach; and the practical relevance of the teaching material and its connection to pupils' everyday lives.

These criteria were selected in view of the nature of the maker approach and the specific characteristics of edutainment, as they ensure a combination of active creative engagement by pupils, the safety of lessons, cross-curricular integration and a high level of motivation in learning. In accordance with these criteria, topics related to the properties of solutions (electrical conductivity of solutions and electrolytes) and electrochemical processes (galvanic cells) were selected for the implementation of maker-based tasks. These topics from the Year 11 chemistry curriculum provide optimal conditions for organising pupils' research, project-based, and design activities, which correspond to the essence of the maker education approach and contribute to the implementation of edutainment. One of the general secondary education institutions in Cherkasy was selected for the pedagogical experiment and statistical analysis of the results, and control and experimental groups of pupils were formed on this basis.

The study involved 44 Year 11 pupils, of whom 23 formed the control group and 21 constituted the experimental group. In the control group, chemistry was taught using traditional instructional methods, whereas in the experimental group maker education tasks and mini-projects incorporating elements of edutainment were employed. The study was conducted in accordance with ethical principles governing research involving participants in the educational process. Pupils participated voluntarily, and verbal consent was obtained from both the pupils and their parents (legal guardians) prior to the commencement of the study. No personal data were collected or processed, and the results are presented in an aggregated form. The study adhered to the principles of academic integrity and ethical guidelines for conducting educational research (World Medical Association, 2013). The educational experiment consisted of three stages: the baseline stage, the formative stage and the control stage. The following criteria were identified to assess the level of pupils' cognitive activity: interest in the subject, engagement whilst completing learning tasks, independence in learning activities, participation in practical and research work, and the capacity for reflection. Assessment was carried out on the basis of questionnaire results, pedagogical observation and analysis of the completion of practical tasks.

A standardised assessment scale was used for the quantitative interpretation of the results: high level (75-100% manifestation of the specified indicators), medium level (40-74%), and low level (less than 40%). Pupils were assigned to the appropriate level based on a synthesis of the data obtained according to the specified criteria. Methods of quantitative and qualitative analysis were applied to process the results. In particular, to test the statistical significance of differences between the control and experimental groups, the χ^2 test (Pearson's chi-square) was used to compare the distribution of levels of cognitive activity between the groups at a significance level of $p < 0.05$. This made it possible to assess the effectiveness of using maker tasks as a means of implementing edutainment in the educational process.

RESULTS AND DISCUSSION

The effectiveness of the maker education approach as a means of implementing edutainment in chemistry teaching was examined through a pedagogical experiment comprising initial and formative stages. During the initial stage, the baseline levels of cognitive activity, learning motivation, and pupils' interest in studying chemistry were assessed. To achieve this, pupils were surveyed, classroom observations of their learning activities were conducted, and their performance in chemistry lessons was analysed. Analysis of the responses provided by pupils in the control class revealed an overall low level of cognitive activity. The majority of respondents (approximately 70%) indicated that chemistry lessons were interesting only occasionally, while 25% considered them uninteresting. Only 5% of pupils reported a sustained interest in the subject. More than half of the pupils did not associate chemical knowledge with everyday life: 48% only partially recognised the practical significance of chemistry, and 35% saw no application of chemistry in real-life situations.

With regard to participation in laboratory work, the majority of respondents (more than 60%) completed such activities only at the teacher's request, whereas only a small proportion demonstrated genuine enthusiasm. Furthermore, 80% of respondents stated that they never independently sought additional information related to chemistry. A considerable proportion of pupils assessed their own mastery of the material as low: 61% believed that they possessed only basic knowledge without deeper understanding, while 35% reported that they remembered very little of the material studied. At the same time, 43% of pupils expressed a potential interest in the use of practical or creative tasks in chemistry learning. Generalisation of the questionnaire findings made it possible to determine the levels of cognitive activity among pupils in the control class. As shown in Figure 1, low (47%) and medium (43%) levels of cognitive activity predominated, whereas only 10% of pupils demonstrated a high level. These findings indicate an insufficient level of learning motivation and interest in studying chemistry.

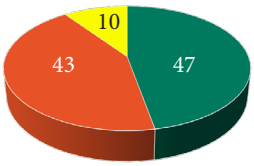

Figure 1. Levels of cognitive activity among pupils in the control class at the diagnostic stage of the experiment
Source: compiled by the authors

A similar trend was observed in the experimental class. Only 10% of pupils reported a sustained interest in chemistry, whereas 67% indicated that the lessons were interesting only occasionally, and 23% considered them uninteresting. In response to the question regarding the practical significance of chemistry, 52% of respondents stated that they sometimes reflect on its applications, 38% did not perceive any practical value in the subject, and only 10% provided specific examples of the use of chemical knowledge in everyday life. With regard to laboratory work, 57% of pupils carried it out only at the teacher's request, 33% participated when the experiments were interesting, and only 10% always worked with enthusiasm. Analysis of the responses also revealed a low level of learning motivation, with the majority of pupils (62%) indicating that receiving marks was the main incentive for studying. Based on the generalisation of the data obtained, the following levels of cognitive activity among pupils in the experimental class were identified: high – 10%; medium – 47%; low – 43%. The summarised results of the questionnaire survey conducted in the experimental class are presented in Figure 2. A comparative analysis of the questionnaire results from the control and experimental classes showed that the figures for both groups are similar. In both classes, medium and low levels of cognitive activity predominate, whilst the proportion of pupils with a high level of interest in the subject is negligible. The comparative questionnaire results are presented in Figure 3.

The data obtained indicated that both groups had similar initial levels of motivation and cognitive activity, which made them comparable for the purposes of the formative stage of the pedagogical experiment. In addition to the questionnaire survey, classroom observations of pupils' learning activities were conducted over the course of three lessons during the initial stage. The observations focused on the following criteria: activity during the explanation of new material; participation in laboratory experiments; collaboration within groups; independence in completing tasks; creativity in practical activities; and the ability to reflect on learning. Analysis of the findings revealed that pupils in both classes demonstrated predominantly moderate levels of learning activity. In the control class, a greater dependence on teacher assistance and a lower degree of creative initiative were observed. Pupils in the experimental class displayed slightly higher levels of group interaction and interest in laboratory work; however, these differences were not substantial. Thus, the results of the questionnaire

survey and classroom observations demonstrated that medium and low levels of cognitive activity and creative skills predominated in both classes. Pupils showed a limited awareness of the practical significance of chemical knowledge and rarely demonstrated independent cognitive activity. At the same time, their positive attitude towards the teacher and their potential interest in practical and creative tasks created favourable conditions for the implementation of the maker education approach in chemistry teaching. These findings provided the basis for the formative stage of the pedagogical experiment, aimed at enhancing pupils' cognitive activity through maker education practices.

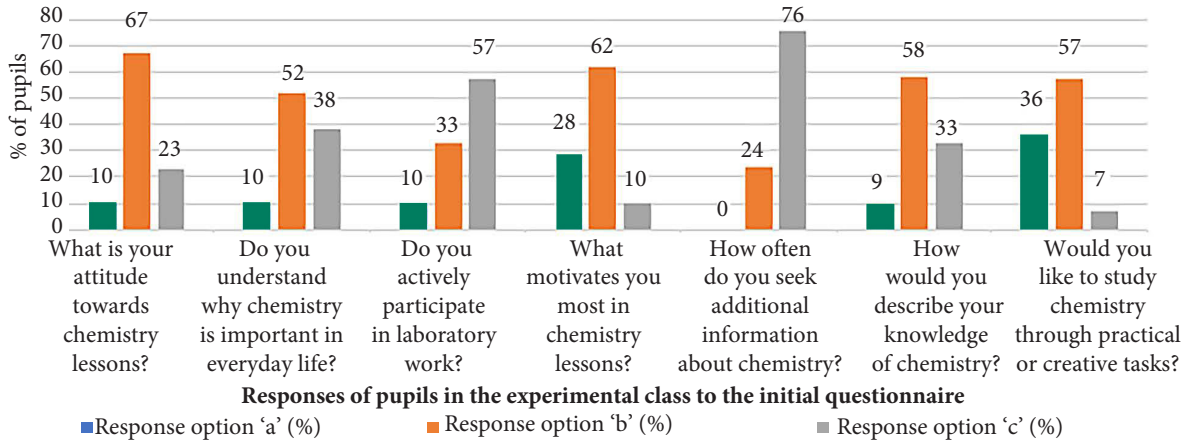

Figure 2. Results of the questionnaire survey of pupils in the experimental class
Source: compiled by the authors

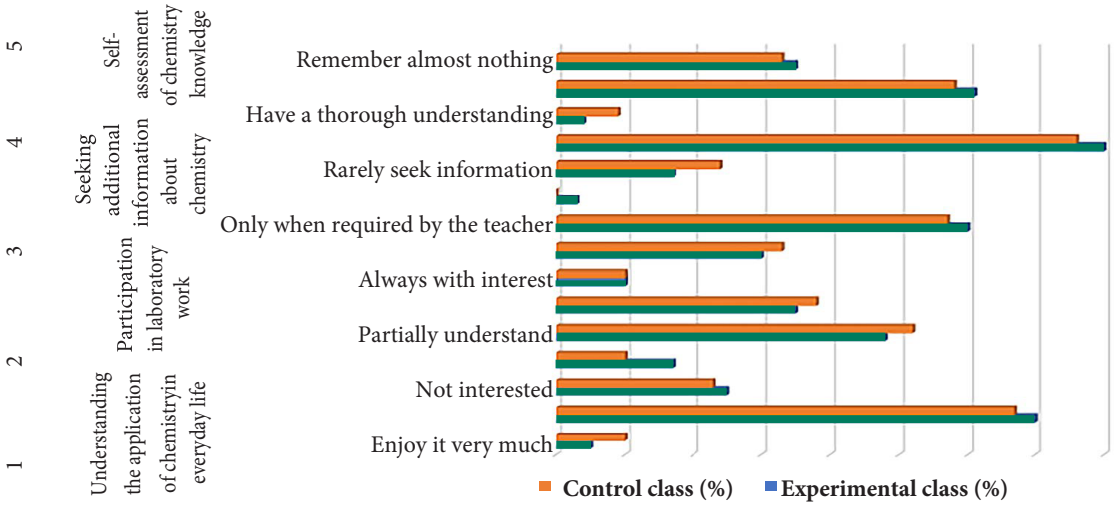

Figure 3. Comparative results of the questionnaire survey of pupils in the control and experimental classes at the initial stage
Source: compiled by the authors

The implementation of the maker education approach in chemistry teaching took place during the formative stage of the pedagogical experiment, during which pupils in the experimental class were involved in maker-based laboratory work, practical tasks, and mini-projects. The principal feature of the instructional process was the combination of research activities with elements of edutainment, involving the use of interactive tasks, team STEM challenges, and the creation of pupils' own experimental models. During the learning process, pupils in the experimental group completed various maker education tasks, including constructing a model of a galvanic cell from readily available materials, producing natural indicators for determining the acidity of solutions, designing simple devices for testing the electrical conductivity of substances, and conducting investigations of salt hydrolysis in the format of a "home pH laboratory". These activities required active group interaction, independent planning of experiments, analysis of the results obtained, and presentation of pupils' own developments. During one of the maker education activities, pupils in the experimental class designed simple devices for determining the electrical conductivity of substances using

readily available materials, including batteries, LEDs, and connecting wires with crocodile clips (Fig. 4).

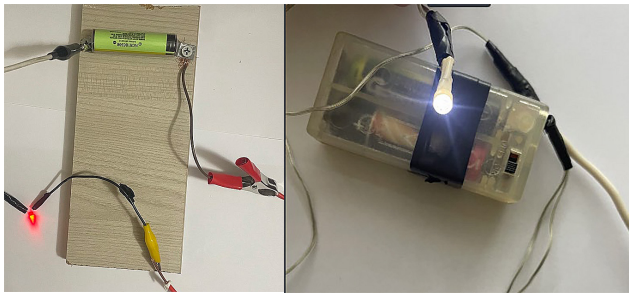

Figure 4. Devices for testing the electrical conductivity of substances, made by the pupils of the experimental class themselves
Source: compiled by the authors

The activity was organised in pairs or small groups, each of which constructed its own model of an electrical conductivity tester. Following a brief introduction and discussion of the operating principle of the device, pupils assembled the electrical circuit, tested its functionality, and investigated the conductivity of various substances. Samples of metals (Cu, Al), aqueous solutions of ionic compounds (NaCl, KCl), distilled water, and a sugar solution were used in the investigation. The results obtained were discussed within the groups and used to formulate conclusions regarding the electrical conductivity of different types of substances. In contrast to the experimental class, the investigation of electrical conductivity in the control class was carried out using a standard laboratory device demonstrated by the teacher, followed by a discussion of the observed results. Pupils recorded the findings in their exercise books; however, their participation was largely reproductive in nature and did not involve independent construction of devices or the organisation of experimental inquiry.

The results of classroom observations demonstrated that, during the completion of maker education tasks, pupils in the experimental class showed a noticeable increase in cognitive activity, initiative, and independence. They more frequently asked clarifying questions, proposed their own approaches to conducting experiments, and attempted to explain observed phenomena on the basis of their knowledge of chemical bonding and the structure of substances. One of the subsequent tasks at the formative stage of the pedagogical experiment involved constructing a model of a galvanic cell using readily available materials. Pupils in the experimental class worked in teams and were tasked with designing a chemical source of electric current using potatoes as a natural electrolyte.

At the initial stage of the activity, certain difficulties were encountered, as the voltage produced was insufficient to illuminate the LED because individual potatoes generated a potential difference of less than 1 V. Initially, the pupils connected the cells in parallel, which did not result in an increase in voltage. Through discussion and independent analysis of the situation, they concluded that a series connection of galvanic cells was required in order to increase the voltage (Fig. 5). This contributed to a deeper understanding of the operating principles of chemical power sources and promoted the development of collaborative problem-solving skills in experimental contexts.

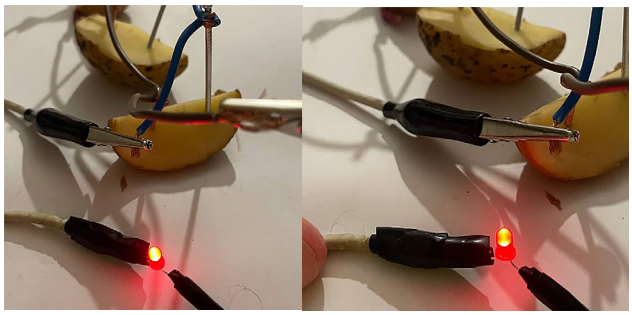

Figure 5. Series connection of potato galvanic cells for powering an LED
Source: compiled by the authors

During the activity, pupils investigated the possibility of reproducing the operation of a galvanic cell using household materials. The class was divided into groups, each employing different design variants. In the first case, potatoes were cut into sections, and a zinc nail and a copper wire were inserted into each piece. The individual cells were then connected in series to form an electrical circuit, to which an LED was attached. After the circuit was completed, the LED illuminated, confirming the generation of an electric current as a result of redox reactions. Another group of pupils implemented an alternative galvanic cell design (Fig. 6).

Figure 6. Model of a potato galvanic cell with a series connection of electrochemical cells
Source: compiled by the authors

For this purpose, three potatoes were used, each containing a zinc plate and a copper wire positioned in such a way that the electrodes did not come into contact with one another. The cells were connected in series using connecting wires with crocodile clips, forming an electrical circuit consisting of three electrochemical cells. An LED was attached to the outer electrodes and illuminated when the voltage reached approximately 1.8 V. The results obtained

confirmed that potatoes can function as natural electrolytes, enabling the conversion of chemical energy into electrical energy. Furthermore, it was established that increasing the acidity of the medium, for example by adding vinegar, contributed to an increase in voltage, indicating the influence of electrolyte composition on the efficiency of the galvanic cell. From a pedagogical perspective, this activity possessed considerable potential for the development of pupils' research, experimental, and project skills. Working with simple materials stimulated cognitive interest, promoted the formation of cause-and-effect relationships between chemical and physical processes, and enhanced pupils' understanding of interdisciplinary links between chemistry, physics, and technology.

Overall, the results of classroom observations demonstrated that the use of maker education tasks, particularly the project "Create own galvanic cell", contributed to increasing pupils' interest, independence, and understanding of the nature of electrochemical processes. In the course of completing the activity, pupils not only confirmed the possibility of using potatoes as a source of electrical energy but also recognised that the efficiency of such a source depends on the number of electrochemical cells and the way in which they are connected. In order to determine the effectiveness of implementing the maker education approach in chemistry teaching, a comparative analysis of the results obtained by pupils in the control and experimental classes at the initial and formative stages of the pedagogical experiment was conducted. To generalise the findings, pupils' levels of cognitive activity were analysed on the basis of questionnaire responses and classroom observations. At the final stage of the pedagogical experiment, a repeated assessment of the levels of cognitive activity among pupils in both the control and experimental classes was carried out. The assessment took place after the completion of the formative stage and the study of the relevant chemistry topic. To ensure the comparability of the results, the same instruments used at the initial stage were employed, namely the questionnaire, classroom observations, and analysis of pupils' performance in learning tasks. Comparative analysis of the results obtained at the initial and final stages of the experiment demonstrated positive changes in the development of cognitive activity in both groups; however, the most substantial improvements were observed in the experimental class. In particular, the proportion of pupils with a high level of cognitive activity in the experimental class increased from 10% to 43%, whereas in the control class this indicator rose only from 10% to 17%. At the same time, the proportion of pupils with a low level of cognitive activity in the experimental group decreased from 43% to 9%, compared with a reduction from 47% to 31% in the control group. Statistical analysis using Pearson's χ^2 test confirmed that the differences between the groups at the final stage were statistically significant ($p < 0.05$). The findings were generalised and used to determine the dynamics of pupils' levels of cognitive activity. A comparative description of changes in pupils' levels of cognitive activity is presented in Table 1.

Table 1. Dynamics of the levels of cognitive activity among pupils in the control and experimental classes

Level of cognitive activity	Control class (before the experiment)	Control class (after the experiment)	Experimental class (before the experiment)	Experimental class (after the experiment)
High	10 %	17 %	10 %	43 %
Medium	43 %	52 %	47 %	48 %
Low	47 %	31 %	43 %	9 %

Source: compiled by the authors

The results of the study confirm the effectiveness of using maker-based tasks in the chemistry learning process. Involving pupils in constructing their own models, carrying out practice-oriented investigations and engaging in teamwork helped to stimulate cognitive activity, develop research skills and foster sustained motivation to study the subject. The practical findings of the study support the recommendation to incorporate maker tasks into the school chemistry curriculum, particularly in the form of mini-projects, STEM challenges and practical work on constructing simple devices. It is advisable to introduce such tasks both when studying topics such as electrochemistry, solutions, acids and bases, and in extracurricular activities, with the aim of enhancing pupils' cognitive engagement and learning motivation. The results obtained are consistent with the findings of other researchers who emphasise the effectiveness of using practice-oriented and activity-based approaches in teaching. In particular, the works of M. Honey & D.E. Kanter (2013) and E.R. Halverson & K.M. Sheridan (2014) note that involving pupils in design, experimental and project-based activities helps to increase learning motivation, develop cognitive activity and foster a lasting interest in learning.

The results obtained in this study not only confirm these findings but also expand upon them in the context of applying the maker approach as a means of implementing edutainment in chemistry teaching. In particular, it has been established that combining practical activities with elements of interactivity, creative design and teamwork creates favourable conditions for stimulating pupils' cognitive activity and fostering their intrinsic motivation to learn. In the academic literature, maker education is regarded as a pedagogical approach based on the ideas of constructivism and constructionism, which involves the acquisition of knowledge through active engagement, the creation of physical or digital objects, and the solving of practical problems. This approach is linked to the concept of learning by doing, according to which learning is most

effective when learners are directly involved in practical activities and experimentation.

Considerable attention in contemporary research is devoted to analysing the development of maker education as a component of the STEM approach. In particular, A. Ioannou & B.E. Gravel (2024) investigated trends in the development of maker education and outlined the prospects for its transformation in the context of STEM+ and transdisciplinary learning. The authors emphasised the importance of the learning through making approach as the basis for integrating various educational disciplines. The study by C.E. George-Reyes *et al.* (2025) examined the development of maker education within an inclusive educational environment, particularly through the activities of makerspaces, and found that it contributes to the development of STEM skills and increases the engagement of various groups of learners. M. Schad & W.M. Jones (2020) conducted a systematic review of academic literature on the maker movement in education and concluded that the use of the maker approach fostered the development of critical thinking, practical skills and activity-based learning. Similar results were obtained in the study by M. Schad *et al.* (2025), which, based on a qualitative analysis, examined a chemistry teacher's experience of implementing maker-oriented teaching. The authors demonstrated that such activities help to increase pupils' engagement and develop practical skills in STEM education. The findings were consistent with the conclusions of this study, confirming the value of the maker approach as a means of integrating different educational disciplines and developing learners' practical skills.

Contemporary research emphasises that maker education creates new opportunities for organising activity-based and inquiry-based learning, as it promotes the active involvement of learners in the creation of their own projects, prototypes, and models. A systematic review of research on maker education notes that such approaches foster the development of creativity, critical thinking and collaboration skills, whilst also increasing pupils' interest in STEM subjects. These findings were consistent with the approach adopted in this study, in which maker activities are regarded as the foundation for developing the research and creative competences of future chemistry teachers. The researchers also emphasise that makerspaces create conditions for the integration of science, technology, engineering and mathematics through practical activities and design. Through the use of a variety of materials, digital technologies and engineering tools, pupils have the opportunity to experiment, develop their own projects and apply scientific knowledge in real-life situations (Nadal *et al.*, 2025). This confirms the value of using makerspaces in chemistry education, particularly for organising practice-oriented activities, which was a key component of the edutainment approach. At the same time, this study emphasises the combination of maker activities with edutainment, which broadens the scope for their application in the training of future chemistry teachers.

Furthermore, academic research emphasises that the introduction of maker approaches into the learning process has contributed to the development of an active stance among learners, as they acted not only as consumers of knowledge but also as creators of their own educational products. In the process of creating physical or digital artefacts, students can experiment with various technologies, analyse the results of their work and refine the models they have created, which has fostered a deeper understanding of the subject matter (Larson, 2024). At the same time, the studies analysed have not paid sufficient attention to combining maker activities with elements of edutainment, which highlights the need for further research in this area. Unlike the majority of previous studies, which primarily consider maker education as a tool for STEM learning, the present research focuses on its application as a means of implementing edutainment. Thus, the analysis of scientific sources indicates that maker education possesses considerable potential for organising activity-based, interactive, and creative learning. Nevertheless, the use of maker education as a means of implementing edutainment in the preparation of future chemistry teachers remains insufficiently explored, which determines the focus of the present study.

CONCLUSIONS

The study confirmed the appropriateness of using the maker education approach as a means of implementing edutainment in the methodological preparation of future chemistry teachers. An analysis of scientific and pedagogical sources demonstrated that the combination of practical activities, experimentation, and creative design provides favourable conditions for the development of research skills, critical thinking, and increased motivation to study the natural sciences. The results of the pedagogical experiment showed that, at the initial stage, medium and low levels of pupils' cognitive activity predominated in both groups under investigation, indicating insufficient interest in studying chemistry and a limited understanding of the practical significance of the learning material.

The introduction of maker education tasks incorporating elements of edutainment during the formative stage contributed to the activation of learning activities among pupils in the experimental class. In the course of completing practice-oriented tasks, including the construction of galvanic cell models, the design of devices for determining the electrical conductivity of substances, and the conduct of experimental investigations, pupils demonstrated higher levels of initiative, independence, and engagement with learning activities. Comparative analysis of the results obtained at the initial and final stages of the experiment revealed a substantial positive development in the cognitive activity of pupils in the experimental class. In particular, the proportion of pupils with a high level of cognitive activity increased from 10% to 43%, whereas in the control class this indicator rose only to 17%. At the same time, the proportion of pupils with a low level of

cognitive activity in the experimental group decreased from 43% to 9%. These findings confirm the effectiveness of maker education tasks as a means of increasing motivation and stimulating pupils' cognitive activity in the process of learning chemistry.

Thus, the use of the maker education approach in combination with elements of edutainment contributed to the development of pupils' research, project, and communication skills, fostered their creativity, and enhanced their understanding of chemical phenomena through practical activities. The study identified the didactic potential of the maker education approach in the formation of subject-specific and key competences in chemistry, particularly the ability to conduct experiments, develop critical thinking, independently search for solutions, and apply acquired knowledge in practical life situations. In addition, a methodological model for organising maker education activities in chemistry teaching was developed, comprising successive stages of motivation, design, product creation, presentation of results, and reflection. The study also resulted in the creation of a series of maker education tasks and educational mini-projects for lessons and extracurricular activities, combining practical and creative components of learning and promoting the integration of chemistry with physics, biology, technology, and environmental studies.

The results obtained confirm the appropriateness of using the maker education approach as an effective means of implementing edutainment in the methodological preparation of future chemistry teachers. Involving student teachers in the development and implementation of maker education tasks within the educational process contributes to the formation of their professional competences, particularly the ability to design practice-oriented learning environments, organise pupils' research activities, and integrate innovative educational approaches into chemistry teaching. Prospects for further research include the development of a system of maker education practices for different topics within the school chemistry curriculum, as well as the exploration of opportunities for integrating the maker education approach with digital technologies, STEM education, and STEAM education in the professional preparation of future teachers of the natural sciences.

ACKNOWLEDGEMENTS

None.

FUNDING

None.

CONFLICT OF INTEREST

None.

REFERENCES

[1] Brandl, L.C., & Schrader, A. (2024). Serious games in higher education in the transforming process to Education 4.0. *Education Sciences*, 14(3), article number 281. doi: 10.3390/educsci14030281.

[2] Calheiro, L.B., & Greca, I.M. (2025). Which maker and STEAM integration styles stand out in education? A systematic review of pedagogical practices in teacher education. *International Journal of Technology and Design Education*, 36, 951-981. doi: 10.1007/s10798-025-10017-y.

[3] Chen, K., Chu, S.L., Quek, F., & Schlegel, R.J. (2024). Integrating making with authentic science classes: An approach and evidence. *Journal of Science Education and Technology*, 33, 479-492. doi: 10.1007/s10956-024-10097-w.

[4] Feldman-Maggor, Y., Blonder, R., & Alexandron, G. (2025). Perspectives of generative AI in chemistry education within the TPACK framework. *Journal of Science Education and Technology*, 34, 1-12. doi: 10.1007/s10956-024-10147-3.

[5] George-Reyes, C.E., Tapia-Bastidas, T., Sandoval-Benitez, L.F., Caicedo-Quiroz, R., & Pinto-Santos, A.R. (2025). Rethinking maker education: Makerspaces, gender, and STEM skills in the era of inclusive educational intelligence. *Frontiers in Education*, 10, article number 1729067. doi: 10.3389/feduc.2025.1729067.

[6] Halverson, E.R., & Sheridan, K.M. (2014). The maker movement in education. *Harvard Educational Review*, 84(4), 495-504. doi: 10.17763/haer.84.4.34j1g68140382063.

[7] Honcharuk, V., Parakhnenko, V., Kyrpychova, I., & Dekarchuk, M. (2025). Innovative teaching technologies in the natural science education system of Ukraine. *Problems of Education in the 21st Century*, 83(3), 52-70. doi: 10.36690/2733-2039-2025-3-52-70.

[8] Honey, M., & Kanter, D.E. (Eds.). (2013). *Design, make, play: Growing the next generation of STEM innovators.* New York: Routledge. doi: 10.4324/9780203108352.

[9] Ioannou, A., & Gravel, B.E. (2024). Trends, tensions, and futures of maker education research: A 2025 vision for STEM+ disciplinary and transdisciplinary spaces for learning through making. *Educational Technology Research and Development*, 72, 1-14. doi: 10.1007/s11423-023-10334-w.

[10] Kolodii, V., Koreneva, I., Prokopenko, N., Huda, O., & Shaforost, Y. (2025). Development of interactive virtual laboratories for distance learning in natural sciences. *Revista Eduweb*, 19(3), 153-168. doi: 10.46502/issn.1856-7576/2025.19.03.10.

[11] Kucher, T. (2021). Principles and best practices of designing digital game-based learning environments. *International Journal of Technology in Education and Science (IJTES)*, 5(2), 213-223. doi: 10.46328/ijtes.190.

[12] Larson, E.A.P. (2024). Maker education meets technology education: Reflections on good practices. *Journal of Technology Education*, 36(1), 106-111. doi: 10.21061/jte.v36i1.a.6.
[13] Li, M., Ma, S., & Shi, Y. (2023). Examining the effectiveness of gamification as a tool promoting teaching and learning in educational settings: A meta-analysis. *Frontiers in Psychology*, 14, article number 1253549. doi: 10.3389/fpsyg.2023.1253549.
[14] Nadal, O., Usart, M., Valls-Bautista, C., Alcantar-Nieblas, C., & Glasserman-Morales, L.D. (2025). Integration of maker education in STEAM: A systematic literature review. *Educational Process: International Journal*, 19, article number e2025587. doi: 10.22521/edupij.2025.19.587.
[15] Ou, Q., & Chen, X. (2024). Investigation and analysis of maker education curriculum from the perspective of artificial intelligence. *Scientific Reports*, 14, article number 1959. doi: 10.1038/s41598-024-52302-1.
[16] Ramírez-Ruiz, J.J., Vargas-Sánchez, A.D., & Boude-Figueredo, O.R. (2024). Impact of gamification on school engagement: A systematic review. *Frontiers in Education*, 9, article number 1466926. doi: 10.3389/feduc.2024.1466926.
[17] Schad, M., & Jones, W.M. (2020). The maker movement and education: A systematic review of the literature. *Journal of Research on Technology in Education*, 52(1), 65-78. doi: 10.1080/15391523.2019.1688739.
[18] Schad, M., Greene, M., & Jones, M. (2025). Maker-centered learning in STEM: A case study of a chemistry teacher's lived experience. *International Journal of Instruction*, 18(2), 85-102. doi: 10.29333/iji.2025.1826a.
[19] Sorochynska, O.A., Tanska, V.V., & Hohola, I.O. (2022). Implementation of STREAM education in preschool education institutions with elements of maker activities. *Bulletin of Zhytomyr Ivan Franko State University. Pedagogical Sciences*, 110, 49-66. doi: 10.35433/pedagogy.3(110).2022.49-66.
[20] Steinkuehler, C. (2023). Games as social platforms. *Games: Research and Practice*, 1(1), article number 7. doi: 10.1145/3582930.
[21] World Medical Association. (2013). Declaration of Helsinki: Ethical principles for medical research involving human subjects. *JAMA*, 310(20), 2191-2194. doi: 10.1001/jama.2013.281053.

Юлія Шафорост
Кандидат хімічних наук, доцент
Черкаський національний університет імені Богдана Хмельницького
18031, бульв. Шевченка, 81, м. Черкаси, Україна
https://orcid.org/0000-0002-0002-2803
Валентина Шпак
Доктор педагогічних наук, професор
Черкаський національний університет імені Богдана Хмельницького
18031, бульв. Шевченка, 81, м. Черкаси, Україна
https://orcid.org/0000-0003-0913-6150
Андрій Шафорост
Студент
Черкаський національний університет імені Богдана Хмельницького
18031, бульв. Шевченка, 81, м. Черкаси, Україна
https://orcid.org/0009-0003-3027-554X

Мейкерство як засіб реалізації едьютейнменту у навчанні хімії учнів старшої школи

Анотація. У сучасних умовах розвитку освіти важливого значення набуває використання інноваційних педагогічних підходів, спрямованих на підвищення мотивації здобувачів освіти та розвиток їхньої дослідницької і творчої активності. Одним із перспективних напрямів є поєднання едьютейнменту та мейкерської освіти. Метою дослідження було обґрунтування та експериментальна перевірка ефективності використання мейкерського підходу як засобу реалізації едьютейнменту в процесі навчання хімії учнів 11-х класів. У дослідженні було використано комплекс теоретичних та емпіричних методів: аналіз і узагальнення науково-педагогічної літератури, педагогічне моделювання, педагогічне спостереження, анкетування, бесіди та педагогічний експеримент. Результати педагогічного експерименту засвідчили, що на констатувальному етапі в обох групах переважали середній і низький рівні пізнавальної активності. У процесі формувального етапу учні експериментального класу виконували мейкерські завдання та міні-проєкти, що передбачали створення експериментальних моделей і проведення досліджень. Виконання таких завдань сприяло підвищенню пізнавальної активності, розвитку творчості та самостійності. Порівняльний аналіз результатів констатувального та підсумкового етапів показав підвищення рівня пізнавальної активності учнів експериментального класу: частка учнів із високим рівнем зросла з 10 % до 43 %, тоді як кількість учнів із низьким рівнем зменшилася з 43 % до 9 %. Отримані результати підтвердили ефективність використання мейкерських завдань як засобу активізації навчальної діяльності та підвищення мотивації до вивчення хімії. Практична цінність дослідження полягала у розробленні методичної моделі організації мейкерської діяльності та системи мейкерських завдань для навчання хімії, апробованих студентами під час педагогічної практики

Ключові слова: мотивація; пізнавальна активність; проєктування; експериментування; STEM-освіта

UDC 378.147:174:004
DOI: 10.52534/msu-pp2.2026.20

ISSN 2413-3329
E-ISSN 2520-6788

Yuliia Yevtushenko*
PhD in Pedagogy, Associate Professor
State Establishment "Lugansk State Medical University"
33028, 36 16 Lypnia Str., Rivne, Ukraine
http://orcid.org/0000-0002-7315-3337

Educational technologies for developing ethical reflection in future doctors within a digital learning environment

Article's History:
Received: 12.01.2026
Revised: 13.04.2026
Accepted: 25.05.2026
Published: 29.06.2026

Suggested Citation:
Yevtushenko, Yu. (2026). Educational technologies for developing ethical reflection in future doctors within a digital learning environment. *Scientific Bulletin of Mukachevo State University. Series "Pedagogy and Psychology"*, 12(2), 20-34. doi: 10.52534/msu-pp2.2026.20.

*Corresponding author
(julia.evtyshenko@ukr.net)

Abstract. The digital learning environment in medical education increasingly influences not only the organisation of the educational process but also the professional and value-based formation of the future doctor. The aim of the article was to theoretically substantiate the potential of educational technologies within the digital learning environment in fostering ethical reflection in future doctors, as well as to determine the pedagogical mechanisms and conditions for the effective use of these technologies in professional training. The methodology of the study was based on a combination of competence-based, axiological, learner-centred, reflective and environmental approaches. Theoretical and comparative analysis, systematisation, generalisation, interpretation and theoretical comprehension of scholarly provisions were used. It was established that the digital learning environment should be considered not only as a technical infrastructure of learning but also as a pedagogically organised space for the professional and value-based formation of the future doctor. It was found that ethical reflection is an integrative result of professional training, manifested in the ability to comprehend the moral content of professional decisions, analyse value-based contradictions in clinical situations, correlate professional expediency with the humanistic orientations of medical activity, and correct one's own professional position in accordance with the ethical requirements of the profession. It was determined that the greatest potential for its formation is possessed by clinical case analysis, problem-based learning, simulation-based learning, virtual patient technology, reflective writing, electronic portfolio, moderated online discussion and pedagogically organised feedback technologies. The pedagogical mechanisms of the influence of these technologies were theoretically substantiated, in particular the problematisation of moral choice, contextualisation of the professional situation, dialogical comprehension, reflective distancing, comparison of alternatives, integration of professional knowledge and value judgement, personalisation of professional experience and transition to internal ethical self-regulation. The pedagogical conditions for the effective use of these technologies in the digital learning environment were determined. The practical significance lies in the possibility of using the results of the study for designing digital courses, clinical cases, simulation scenarios, reflective tasks and models of pedagogical support in the system of professional training of future doctors

Keywords: moral judgement; professional self-regulation; clinical decision-making; value-based learning; medical education; professional training; pedagogical conditions

Copyright © The Author(s). This is an open access article distributed under the terms of the Creative Commons Attribution License 4.0 (https://creativecommons.org/licenses/by/4.0/)

INTRODUCTION

The digital transformation of higher medical education is changing not only the organisational forms of teaching, but also the very nature of future doctors' professional development. In today's digital learning environment, medical students in higher education institutions work not only with learning materials, but also with clinical scenarios, simulation models, digital cases, interactive platforms, self-assessment tools, and feedback instruments. These tools and formats expand the possibilities of professional training, while also changing expectations regarding its content and pedagogical logic. Under these conditions, the training of future doctors can no longer be reduced to acquiring knowledge, developing clinical skills, and rehearsing professional algorithms. It increasingly requires the ability to reflect on the moral content of professional decisions, critically analyse complex situations, relate clinical expediency to its ethical implications, and act responsibly towards other people. For this reason, the formation of ethical reflection in future doctors has become especially relevant in the context of the digitalisation of medical education.

Modern research shows growing attention to the digitalisation of medical education, yet the ethical and reflective development of future doctors is not always sufficiently connected with this process. O. Ogundiya *et al.* (2024) examined the potential of digital educational resources in medical training and concluded that the digital environment expands access to learning, increases the flexibility of the educational process and supports students' more active engagement with learning material. S.S. Guraya *et al.* (2024) examined e-professionalism in medicine and showed that digital identity, virtual communication and online interaction are becoming important elements of future doctors' professional behaviour. These findings confirm that the digitalisation of medical education has not only a technological but also a value-based dimension. E. Simou (2025) emphasised that, in the age of artificial intelligence, medical education must maintain a balance between digital opportunities, the development of soft skills, humanistic interaction and future doctors' professional responsibility. L. Çetinkaya *et al.* (2024) analysed the use of a mobile virtual patient application to develop students' clinical reasoning and found that this technology promotes students' more active engagement in analysing clinical situations and supports their decision-making skills. This is of fundamental importance for the stated topic, since a virtual patient can be used not only to develop clinical reasoning but also to interpret the moral consequences of professional choice. Y. Zhu *et al.* (2026) examined the challenges of using digital and intelligently supported tools in the education of future healthcare professionals and stressed that such tools have considerable educational potential but require pedagogical guidance, critical control and ethical interpretation.

A separate area of recent research concerns reflection as a mechanism for the professional development of future healthcare specialists. S. Heydari & A. Beigzadeh (2024) considered reflection an important factor in professional learning and emphasised that reflective activity helps students become more aware of personal experience, analyse professional actions and move from formal knowledge acquisition to more conscious professional development. At the same time, the ethical dimension of reflection requires separate pedagogical interpretation, since the moral content of a doctor's decision cannot be reduced to general self-analysis. C. Skinner *et al.* (2024) examined the role of reflective practices in medical education and highlighted their link with students' professional self-awareness. The authors showed that reflection acquires educational value when linked to real or simulated professional experience.

Ethics and professionalism in medical education are also actively discussed in scholarly literature. K.C.Y. Leung & C. Peisah (2023) analysed ethical problems in medical practice and emphasised the importance of moral judgement, professional responsibility and the ability to act in situations of value-based ambiguity. This approach shows that doctors' training should cover not only knowledge of ethical norms but also the ability to apply these norms in complex professional situations. D.K. Gupta & A. Chaudhuri (2025), in a systematic review of educational approaches to developing ethics and professionalism in medical education, concluded that the most effective methods involve students in active analysis of situations, discussion of dilemmas, and reflection on professional responsibility. This directly corresponds to the idea that pedagogically organised technologies are needed to transform ethical knowledge into an internal professional position.

Despite current research on the digitalisation of medical education, reflective practices, ethics and doctors' professionalism, the question of how educational technologies within the digital learning environment can purposefully develop future doctors' ethical reflection remains insufficiently addressed. Existing studies mainly analyse either the technological possibilities of digital tools or the general principles of professional ethics, whereas the pedagogical mechanisms for the transition from digital learning interactions to the moral interpretation of a professional decision require separate theoretical justification. The aim of the article was to provide a theoretical justification of the potential of educational technologies within the digital learning environment for developing future doctors' ethical reflection, and to identify the pedagogical mechanisms and conditions for the effective use of these technologies in professional training.

MATERIALS AND METHODS

The methodological basis of the study combined competence-based, axiological, learner-centred, reflective, and environmental approaches. The competence-based approach made it possible to view ethical reflection as an important component of future doctors' professional readiness, expressed in the ability not only to know ethical norms, but also to apply them in situations of professional choice, to analyse the moral complexity of clinical action, and to

relate professional decisions to human consequences. The axiological approach ensured a focus on the value content of medical education and made it possible to interpret the digital learning environment as a space in which not only information is transmitted, but also professionally significant values, norms of responsibility, respect for patients' dignity, ethical sensitivity, and moral self-regulation are formed. The learner-centred approach made it possible to view the student as an active subject of professional development who does not merely perform the proposed learning tasks, but is also involved in interpreting experience, evaluating personal decisions, comparing alternatives, and shaping a personal professional position. The reflective approach became central to revealing the mechanisms by which externally prescribed ethical requirements are internalised and become an internal regulator of professional conduct. The environmental approach made it possible to consider the digital learning environment not as a set of separate technical tools, but as a pedagogically organised space of interaction in which content, technologies, communication, feedback, and the modes of presenting professional situations jointly influence the development of ethical reflection.

Theoretical analysis was applied to clarify the key concepts of the study, primarily the concepts of ethical reflection, educational technologies, digital learning environment, and future doctors' professional training, as well as to identify the semantic links between them. Comparative analysis made it possible to examine different scholarly approaches to understanding reflection, professional ethics, the digitalisation of education, and the pedagogical potential of educational technologies. This method also made it possible to identify points of intersection between these thematic fields and to reveal underdeveloped aspects of the problem. Systematisation was used to organise scholarly views on the types of educational technologies functioning in the digital learning environment and to group these technologies according to the potential influence on the ethical interpretation of professional situations. Generalisation helped to formulate conceptual conclusions about the pedagogical possibilities of the digital learning environment for fostering ethical reflection in future doctors. The interpretative method was used to reveal the internal logic through which educational technologies influence value judgement, moral self-awareness, the analysis of alternatives, and the self-correction of professional position. Conceptual modelling was used to develop a theoretical understanding of how educational technologies within the digital learning environment may contribute to the development of ethical reflection in future doctors.

In the first stage, the study's conceptual field was clarified, and the semantic boundaries of the key categories required for the theoretical analysis of the problem were defined. At the second stage, the specific features of the digital learning environment in the system of future doctors' professional training were examined, and its potential was identified not only for cognitive development but also for value-based and reflective development. At the third stage, educational technologies potentially productive for fostering ethical reflection were identified and pedagogically interpreted with regard to the specific character of medical education. At the fourth stage, the pedagogical mechanisms through which these technologies influence the moral interpretation of professional situations, the development of value judgement, the capacity for reflective distancing, and the self-correction of a personal professional position were determined. At the fifth stage, the pedagogical conditions under which educational technologies within the digital learning environment may effectively foster ethical reflection in future doctors were formulated.

The source base of the theoretical analysis comprised studies that address the digitalisation of medical education, the use of educational technologies in the professional training of future healthcare specialists, the role of reflection in professional development and the importance of the ethical component in medical education (Ogundiya *et al.*, 2024; Heydari & Beigzadeh, 2024; Sadeq *et al.*, 2025). The selection of these studies was based on relevance to three substantive dimensions of the stated problem: the digital educational environment, students' reflective development, and the ethical dimension of doctors' professional training. Within the study, attention was focused not on the technical characteristics of digital tools but on how digital tools can be used pedagogically in situations of moral choice, professional analysis, and reflective reconsideration of a personal professional position. This perspective was chosen to define the theoretical basis for further analysis of educational technologies as a pedagogical means of supporting future doctors' ethical reflection.

The methodology of the theoretical analysis was based on a consistent movement from the general to the specific: from understanding ethical reflection as a pedagogical phenomenon to characterising the digital learning environment as a space of professional and value-based development; from identifying educational technologies relevant to medical education to revealing the specific mechanisms of technological influence on students' ethical self-determination; and from analysing individual technological solutions to formulating coherent pedagogical conditions for the effective use of these technologies. This logic made it possible to move from describing individual digital tools to a theoretically substantiated understanding of the role of such tools in fostering ethical reflection in future doctors. The selected methodology and the set of methods used made it possible to examine the problem within the interdisciplinary fields of pedagogy, professional education, and medical education, and provided the basis for further theoretical substantiation of educational technologies as a means of fostering ethical reflection in the digital learning environment.

RESULTS AND DISCUSSION

Ethical reflection as a pedagogical outcome of the professional training of future doctors

In the professional training of future doctors, particular importance lies not only in mastering specialised knowledge,

clinical algorithms, and practical skills, but also in developing the ability to understand the moral meaning of professional activity. Medical practice belongs to those fields in which no decision is purely technical, because it is almost always linked to responsibility for another person, patient dignity, safety, the right to choose, trust in the professional, and the consequences of intervention in human life and health. For this reason, the professional training of future doctors cannot be complete without developing the ability to reflect ethically on professional actions, decisions, motives, and position. In this context, ethical reflection appears not as an optional addition to professional education, but as one of the essential outcomes of such education.

In a broad pedagogical sense, reflection is associated with the individual's ability to analyse their personal experience, consider the grounds of actions, assess the appropriateness of these actions, recognise contradictions, rethink individual ways of thinking and behaving, and adjust them in response to new meanings and demands. In professional education, reflection performs a particularly important function, as it enables the transition from external acquisition of knowledge to its internal acceptance, from mechanical compliance with requirements to conscious professional action, and from reproductive learning to personally meaningful professional development (Sydoryako & Sydoryako, 2023; Sarraf-Yazdi *et al.*, 2024; Skinner *et al.*, 2024). M.H. Shah *et al.* (2023) also linked reflective practices in medical education to the development of students' social responsibility and the formation of professional consciousness. This strengthens the understanding of reflection as a mechanism not only of individual self-analysis but also of the value-based development of a future specialist. For future doctors, this is especially important because medical practice requires constant interplay between professional decision-making and its human and moral dimensions.

However, in the training of future doctors, it is not enough to develop only general reflectiveness as the ability to analyse professional activity. What becomes professionally significant is the development of ethical reflection itself, that is, a form of understanding that enables future specialists to see the moral context behind a clinical situation, identify value-based contradictions, recognise the possible consequences of professional decisions for the patient, and assess professional action not only in terms of correctness or effectiveness, but also in terms of ethical justification (Young *et al.*, 2024; Bashkirova *et al.*, 2025). Ethical reflection presupposes the ability to pause before acting automatically, to consider the moral meaning of a professional choice, and to revise a personal professional position in the light of new experience.

In this sense, ethical reflection cannot be reduced to knowledge of codes, norms of professional conduct, or deontological rules. In this context, it is important to consider the position of N. Nychkalo & L. Gutor (2024), who viewed the deontological education of future medical students as a combination of communicative culture, professional norms, and digital learning tools. Knowledge of norms is a necessary foundation, but it does not, in itself, guarantee the ability to act morally in a real or simulated professional situation. A future doctor may reproduce normative provisions but remain unable to interpret a specific situation in which several values conflict, no standard solution is unambiguous, and professional action requires inner responsibility, tact, empathy, and moral maturity. For this reason, ethical reflection should be regarded as a more complex pedagogical construct than merely a set of ethical knowledge. It involves the internal understanding of professional norms and a readiness to adjust personal professional behaviour.

Within the structure of ethical reflection in future doctors, it is appropriate to distinguish several interrelated dimensions of professional development. The first is cognitive and relates to understanding ethical principles, norms of professional conduct, the nature of medical responsibility, patients' rights, and the moral complexity of medical practice. The second is value-based and concerns the ability to perceive professional activity not merely as the performance of functions, but as service to a person that requires respect, attentiveness, humanity, sensitivity, and responsibility. The third is personal-reflective and is expressed in the ability to analyse personal reactions, motives, attitudes, inner contradictions, and readiness to act in accordance with the ethical requirements of the profession. The fourth may be defined as behavioural-regulatory, since ethical reflection is manifested not only in internal judgements but also in specific decisions, modes of communication, the choice of professional position, and the willingness to bear responsibility for the consequences of professional actions. This approach provides grounds for viewing ethical reflection as an integrative outcome of professional education, combining knowledge, values, self-awareness, moral judgement, and the capacity for self-regulation. Ethical reflection cannot be formed through simple information delivery or normative instruction. It emerges and develops under educational conditions in which students engage with professionally significant situations, encounter moral ambiguity, analyse alternatives, justify a personal position, consider the consequences of decisions, and relate these consequences to the humanistic orientations of the medical profession. Therefore, it develops not through memorising correct answers but by involving future doctors in the practices of moral reasoning, professional choice, and personal self-determination.

Ethical reflection should be regarded as one of the key outcomes of the professional training of future doctors. Y.O. Polkovnikov (2024) emphasised that developing the professional culture of future dentists at the initial stage of training requires purposeful pedagogical organisation. This position corresponds to the interpretation of ethical reflection as an outcome of the educational process. In this context, ethical reflection does not exist outside the educational process as a predetermined personal quality. Rather, this quality is formed through specially organised pedagogical interaction, the substantive content of learning, the nature

of professional tasks, modes of communication and forms of assessment. The dominance of knowledge reproduction and formal control considerably narrows the space for ethical-reflective development. By contrast, involving students in a pedagogically organised analysis of morally complex professional situations, the justification of a personal position, the comparison of alternatives and the reflective review of an adopted decision gradually shifts ethical requirements from the level of external regulation to the sphere of internal interpretation and personal acceptance.

Within this logic, the professional training of future doctors should be directed not only towards the transmission of professionally significant content, but also towards creating conditions for the development of the ability to observe oneself ethically, interpret professional experience, and make conscious moral choices. At the centre of pedagogical attention should be not only what students know about professional ethics, but also how they understand professionally significant situations and adjust their own professional position. This is where the fundamental difference lies between the formal acquisition of ethical information and the formation of ethical reflection as a pedagogical outcome. The ethical reflection of future doctors is a complex integrative construct formed in the course of professional training and manifested in the ability to understand the moral meaning of professional decisions, analyse value-based contradictions, relate clinical expediency to the humanistic orientations of the profession, assess a personal professional position, and adjust it in accordance with the ethical requirements of medical practice. Such an understanding makes it possible to move from a normative interpretation of ethics in medical education to a pedagogical view of the internal appropriation of ethical norms. The next question, then, is how the digital learning environment may serve as a space not only for the professional development of future doctors, but also for their value-based development.

The digital learning environment as a space for the professional and value-based development of future doctors

In the context of the professional training of future doctors, the digital learning environment is increasingly emerging not only as a technical or organisational basis of the educational process, but as a multidimensional pedagogical space within which knowledge acquisition, professional thinking, value orientations, interaction models and reflection on future practice are developed (Ogundiya *et al.*, 2024; Guraya *et al.*, 2024; Kalbus *et al.*, 2024). This approach makes it possible to move beyond understanding the digitalisation of education as merely transferring traditional teaching to electronic platforms. In the professional training of future doctors, it should instead be viewed as a pedagogically organised system that integrates content, communication, feedback, and the modelling of professional situations, and that requires pedagogical guidance, critical control, and ethical interpretation (Zhu *et al.*, 2026).

This understanding is particularly important for medical education. The training of doctors is a complex process that involves not only mastering large bodies of specialised information, but also gradually entering a professional culture, a system of norms and values, forms of professional responsibility, and ways of interacting with patients. In the traditional educational model, these components were largely formed through direct contact with the teacher, clinical practice, observation of a mentor's professional conduct, and discussion of professionally significant situations. In digitalised education, these processes increasingly involve digital interaction, the modelling of professional situations and pedagogically organised communication, which are closely related to the development of e-professionalism, communicative culture and deontological education in digitally supported medical training (Guraya *et al.*, 2024; Nychkalo & Gutor, 2024). This does not diminish the importance of live pedagogical interaction but changes its forms.

One of the defining characteristics of the digital learning environment is its interactivity. Unlike traditional learning, where students often remain primarily recipients of information, the digital environment far more often involves them in active engagement with the material, the task, the situation, the teacher, and other participants in the educational process. In the professional training of future doctors, this means the opportunity not only to access information but also to analyse clinical scenarios, make decisions under simulated conditions, observe their consequences, compare alternatives, participate in discussions, and reconsider one's own responses. It is precisely this kind of interaction that creates the conditions for moving from the passive acquisition of educational content to active, professional, and value-based self-determination.

Equally important is the digital learning environment's capacity to model professionally significant situations. In medical education, this offers especially valuable opportunities, as it allows clinical cases, communicative situations, moral conflicts, and professional dilemmas to be presented in forms that are accessible for analysis, repeated review, group discussion, and pedagogical support. As a result, future doctors gain a space for safely entering the complexity of the profession before direct contact with real clinical practice. In such conditions, students are required not simply to find the correct answer, but to understand the context, identify the contradiction between possible decisions, and justify their own position.

Another important feature of the digital learning environment is its capacity to support asynchronous reflection. In the traditional classroom format, students are often required to respond quickly, without always having enough time to consider a complex situation, especially when it is value-laden and ambiguous. By contrast, the digital format allows them to return to a case, review the prompt again, reread comments, refine their position, compare it with alternatives, and gradually form a more conscious judgement. This form of reflection is of particular pedagogical

value, because ethical reflection requires time for internal dialogue and for the development of a reasoned position.

The digital learning environment also considerably expands the possibilities for feedback and, consequently, for pedagogical support of students' reflective development. Within it, feedback may be individual, group-based, automated, delayed, or interactive, and it may come from both the teacher and peers through discussion, peer assessment, or comments (Heydari & Beigzadeh, 2024). For the formation of ethical reflection, this is crucial, because students gain the opportunity to see the limits or incompleteness of their own judgement, compare their position with other interpretations of the situation, recognise the hidden consequences of a decision, and adjust their own view. Under such conditions, feedback ceases to be merely an instrument of control and acquires developmental significance.

The pedagogical potential of the digital learning environment is further strengthened by its ability to integrate multiple modalities of educational influence. Text, images, audio visual material, the scenario structure of a case, interactive questions, comments, professional roles, and the visualisation of decision outcomes create a multi-layered environment in which a professional situation appears not abstractly, but in its dynamics and context. This is especially important for future doctors because ethical understanding in medicine is shaped not by abstract rules, but by concrete human situations. It is precisely through this multimodality that the digital learning environment can bring the educational situation closer to the real complexity of professional experience.

At the same time, the digital learning environment does not have an automatic ethical-developmental effect. The mere use of an electronic platform, simulation programme, or digital case does not, in itself, mean that ethical reflection is being developed in students. If digital tools are used only to transmit information, assess knowledge, or practise algorithms technically, they may remain didactically useful but have little effect on the value-based understanding of professional content. This limitation is particularly important in view of studies that emphasise the need for pedagogical guidance, critical control and ethical interpretation in the use of digital tools in medical education (Ursin *et al.*, 2024; Zhu *et al.*, 2026). The ethical potential of the digital environment is revealed only when it is pedagogically directed towards the analysis of morally significant situations, stimulates value-based questioning, opens space for comparing positions, justifying choices, and reflectively revising personal decisions. Thus, what is decisive is not the mere presence of digital technologies, but the way they are embedded in the logic of the professional training of future doctors.

In this context, the digital learning environment should be regarded as a space not only for professional but also for value-based development of future doctor. It combines cognitive, communicative, and reflective experience, the modelling of morally complex situations, and different forms of feedback. For this reason, in contemporary medical education, the digital learning environment should be considered not merely an external technological addition to traditional teaching, but as an important pedagogical resource for fostering ethical reflection in future doctors.

The digital learning environment acquires pedagogical value when it not only provides access to knowledge, but also engages students in understanding professionally significant situations and creates conditions for value-based judgement, reflective analysis, and the self-correction of a professional position. Within this logic, further clarification is needed regarding those educational technologies through which the digital environment can acquire ethical and reflective content.

Educational technologies for forming ethical reflection in future doctors

Understanding the digital learning environment as a space for the professional and value-based development of future doctors naturally raises the question of which educational technologies can most productively shape the development of ethical reflection. In this context, it is important to proceed from the premise that no technology, in itself, has a guaranteed ethical-formative effect. Its pedagogical potential is determined not only by the form of organising learning, but above all by the content it brings into focus, the types of thinking it stimulates, whether it engages students in analysing professionally significant situations, and whether it creates space for value-based choice, argumentation, doubt, reconsideration, and self-correction. Thus, within the professional training of future doctors, the issue is not simply digital learning tools, but technologies that organise students' intellectual and value-based activity.

One of the most productive in this respect is clinical case analysis. Its significance lies in bringing the educational process closer to the real professional situation in which a doctor must make decisions and bear moral responsibility for them (Al-Bedaery *et al.*, 2024). A clinical case almost always contains not only a factual and diagnostic dimension, but also a communicative, emotional, social, and moral context. For this reason, working with cases enables future doctors to perceive a professional situation in its wholeness rather than merely as a task requiring the application of knowledge. In the digital learning environment, this technology offers additional possibilities: cases may have a branched structure and include documents, video fragments, and alternative scenario paths. This enables students not only to search for the correct decision, but also to analyse the situation as morally ambiguous, identify value conflicts, relate clinical expediency to ethical consequences, and form a reasoned professional position.

Similar in logic but broader in pedagogical potential is problem-based learning, in which learning is organised around a problem with no single, obvious solution in advance (Wei *et al.*, 2024; Ota *et al.*, 2026). For the development of ethical reflection, this technology is particularly valuable because it teaches future doctors to act under conditions of uncertainty, incomplete information, competing

alternatives, and the need to justify decisions. It moves students away from the model of passive knowledge reception and engages them in active professional thinking, in which the process of analysis itself, together with the weighing of risks and consequences, becomes important. In the digital environment, this technology may be implemented through interactive scenarios, problem-based modules, digital simulations, collaborative online discussions, and structured tasks for collective solution-seeking. Under such conditions, ethical reflection develops as the ability to think responsibly in a real professional context.

Simulation-based learning also plays an important role in the development of ethical reflection, particularly in those approaches that enable the modelling of professional situations with a high degree of similarity to real clinical practice (Gyamo & Kesari, 2024; Hamilton, 2024). The value of simulation lies in creating a safe space for professional trial, where students can make decisions, make mistakes, and analyse their actions and consequences without putting a real patient at risk. The greatest pedagogical effect is produced by simulations that combine technical action with communicative complexity and moral choice. In the digital learning environment, simulation may take the form of a virtual clinical scenario, an interactive simulator, a branching decision pathway, or a virtual patient model in which each student's decision changes the subsequent course of the situation. In such conditions, future doctors do not merely practise an action, but experience a situation of professional responsibility.

Particular attention should be paid to virtual patient technology, which, in the context of the digitalisation of medical education, has become one of the most promising forms of modelling professional interaction (Çetinkaya *et al.*, 2024; Pavliukovych *et al.*, 2026). Its pedagogical value lies in the fact that students interact not with an abstract task, but with a personified clinical situation involving a medical history, behavioural features, emotional reactions, complaints, communicative barriers, and possible ethical complications. This enables future doctors to see the patient not merely as a carrier of symptoms, but as a person with an individual position, fears, rights, and expectations. Such personification activates the moral and value-based dimension of perception and encourages deeper reflection on the consequences of professional decisions.

Reflective writing also plays an important role in the development of ethical reflection, since written reflective practices in medical education support students' deeper interpretation of experience, professional self-awareness and reconsideration of previous judgements (Shah *et al.*, 2023; Leyland *et al.*, 2024). In the digital environment, it may be implemented through electronic journals, written reflections after cases, reflective essays, responses to structured questions, comments on professional situations, or analytical entries in an electronic course. Unlike an oral response, writing allows students to slow their thinking, formulate an internal position more precisely, and become aware of contradictions. For the development of ethical reflection, this is especially important, because moral understanding requires not only reaction, but also inner work with meaning. In written form, students are more likely to move beyond the formal reproduction of the correct answer and reveal the logic of personal professional thinking.

Closely related to reflective writing is e-portfolio technology, which has not only an accumulative but also a developmental function. In medical education, e-portfolios are used to document students' educational progress, collect evidence of learning, record narratives of lived experience and support reflective interaction with mentors (Dos Santos *et al.*, 2024). If the portfolio is regarded not as a formal collection of completed tasks, but as a tool for understanding professional growth, it can become an important means of forming ethical reflection. An e-portfolio allows students to revisit previous decisions, observe the development of professional thinking, record changes in judgements, compare previous positions with new experiences, and gradually build a more mature view of professional responsibility. In digital form, this technology is particularly valuable because it allows texts, cases, feedback, and self-assessment to be combined within a single reflective field.

Moderated online discussion is also highly significant for the development of ethical reflection, since educational approaches to ethics and professionalism in medical education are more effective when they involve students in active analysis of situations, discussion of dilemmas and reflection on professional responsibility (Bashkirova *et al.*, 2025). In the digital learning environment, it may take the form of a forum, synchronous or asynchronous discussion, debate, group case analysis, or collective consideration of a professional dilemma. Its value lies in helping students move beyond isolated thinking and recognise that the same professional situation may allow for different ethical interpretations. In the course of discussion, they encounter alternative positions, justify their views, and refine their judgements. It is precisely through this that ethical reflection acquires a dialogic character and moves beyond the limits of an individual inner monologue. It becomes especially valuable when the teacher guides the discussion without imposing a single correct answer.

Feedback technologies also have significant potential when used not as formal comments on outcomes but as a means of pedagogical support for students' professional and value-based development. In medical education, feedback and reflective practices help students reconsider their previous judgements, interpret professional experience more deeply and strengthen professional self-awareness (Heydari & Beigzadeh, 2024). Individual teacher comments, peer assessment, self-assessment, structured error analysis, and the comparison of decisions with different possible consequences all contribute to students beginning to see not only whether a decision was correct, but why it was made in that way, what assumptions stood behind it, which moral aspects remained unnoticed, and where haste or one-sidedness appeared. In this way, feedback becomes a resource for reflective self-knowledge and professional maturation.

In the context of contemporary digital education, the technology of analysing ethical dilemmas with the help of intellectually supported digital tools also appears promising, particularly those that can help structure a professional situation, identify alternatives, pose clarifying questions, propose different scenario pathways, or help students see weaknesses in personal argumentation (Weidener & Fischer, 2023). However, in this case, it is especially important to preserve pedagogical control over the learning process. Such tools may be useful for organising thinking, but they should not replace students' moral judgement. Their value lies not in automatically producing the correct answer, but in supporting more consistent and conscious analysis by students. Therefore, intellectually supported digital tools can be productive only when they are integrated into the pedagogical logic of forming reflection rather than used as a substitute for personal understanding.

The analysis above provides grounds to argue that ethical and reflective potential is not inherent in individual digital tools themselves. Rather, such potential is characteristic of educational technologies that combine professional context, problem-based learning, dialogue, variability in decision-making, analysis of consequences, feedback, and students' involvement in interpreting their own professional positions. The shared pedagogical function of these technologies is not only to transmit educational content but also to create conditions for the moral analysis of a professional situation, the justification of choice and the internal self-determination of a future doctor. This requires further clarification of the pedagogical mechanisms through which technologies within the digital learning environment influence the development of ethical reflection.

Pedagogical mechanisms through which educational technologies influence the formation of ethical reflection

Identifying technologies capable of supporting future doctors' ethical reflection does not, in itself, explain their pedagogical effectiveness. For a theoretical understanding of this problem, it is essential to clarify the internal pedagogical processes through which the digital learning environment acquires ethical and developmental content. This is not a matter of outlining the tools again, but of identifying the mechanisms that influence value-based judgement, the moral interpretation of professional situations and future doctors' self-regulation. It is precisely the analysis of these mechanisms that enables the shift from describing technologies to explaining the process by which ethical reflection is formed.

The formation of ethical reflection in future doctors does not occur through the isolated action of a single digital tool, but through the interaction of several pedagogical mechanisms that progressively complicate students' professional thinking and involve them in the analysis of morally significant professional situations (Tokumasu *et al.*, 2024). Some of them take students beyond algorithmic decision-making and problematise moral choice; others place professional action within a concrete human context in which clinical expediency can no longer be considered apart from value-based consequences. For this reason, the problematisation of moral choice and the contextualisation of the professional situation do not oppose one another, but reinforce each other. The first undermines the view of professional action as technically unambiguous; the second fills it with real moral meaning. Within this logic, students are required not simply to find the correct answer but to recognise the ambiguity of the situation and take into account its value-based consequences. It is under such conditions that moral understanding moves from the sphere of declarative knowledge to that of professionally meaningful understanding.

It is equally important that ethical reflection not be confined to the student's inner monologue. It is strengthened through dialogue, comparison of positions, peer assessment, and joint case analysis, when future doctors encounter alternative ways of interpreting the same professional situation. In such a comparison, a personal position no longer appears to be the only possible one, and ethical understanding acquires greater depth and justification. Dialogic understanding becomes especially productive when combined with reflective distancing, that is, the ability to step beyond an immediate reaction, look at a personal decision from the outside, and recognise its premises, emotional impulses, unconscious biases, or superficial judgements (Leung & Peisah, 2023). In the professional training of future doctors, this is particularly important, because many decisions in medical practice may be made under the pressure of time, authority, habit, or fear of error. Digital formats that involve returning to a situation, recording a personal position and discussing it further make it possible to slow down thinking and separate the act of making a decision from its ethical meaning. It is precisely through this combination of dialogue and distancing that students move from spontaneous reaction to conscious analysis of personal professional thinking.

A further deepening of ethical reflection occurs through the comparison of alternatives, the anticipation of consequences, and pedagogically organised feedback. Future doctors begin to think ethically when they see not one possible decision, but several professional options, each with its own advantages, limitations, consequences, and moral risks. Such learning formats, which make it possible to model variable scenarios, compare decisions and see how a situation changes depending on the choice made, develop students' ability to think not linearly but responsibly (Çetinkaya *et al.*, 2024). What becomes important here is not only which decision proved correct, but also why other decisions were less justified and what harm such decisions might cause to the patient or to professional trust. At this stage, feedback becomes especially significant because it enables students to see not only the weaknesses or persuasiveness of a decision, but also the logic of the reasoning: what was taken into account, what was overlooked, which values were prioritised, and which were undervalued. In

this way, feedback becomes a means of self-correcting a professional position.

A special role in the formation of ethical reflection is also played by the integration of professional knowledge and value judgement. In medical education, one often encounters a situation in which the ethical component exists alongside the clinical one rather than being built into it. As a result, students may know the professional material well yet fail to view clinical action as having a moral dimension. Educational technologies become genuinely effective in forming ethical reflection when they unite these two planes: when they require students to combine clinical reasoning with value-based judgement, relate professional expediency to respect for the person, and analyse not only the possibility of intervention but also its moral justification (Young *et al.*, 2024). This integration is strengthened through the personalisation of professional experience, when students stop being external observers of the situation and begin to experience it as significant for personal professional development. Educational technologies that enable students to identify with the role of a future doctor, see the situation through the patient's eyes, and assume responsibility for the consequences of professional decisions make the learning experience internally meaningful and value-based (Çetinkaya *et al.*, 2024; Pavliukovych *et al.*, 2026). It is then that students begin to ask not only what should be done, but also what kind of doctor to become, what professional position to choose, and how this decision affects others.

All these mechanisms are ultimately directed towards a gradual transition from external regulation to internal ethical self-regulation. At the initial stages of learning, students often orient themselves towards external norms, instructions, teacher assessment, or prescribed models of correct behaviour. However, the task of professional education is not only to teach them to act according to a rule, but also to develop their ability to apply ethical orientations independently in new, ambiguous, and unpredictable situations. For this reason, the educational technologies in the digital learning environment have pedagogical value only when they do not stop at checking an answer but involve students in understanding motives, evaluating consequences, justifying choices, and revising previous decisions. In such a case, ethical reflection becomes not a response to an external requirement, but an internal regulator of professional behaviour.

The pedagogical influence of technologies within the digital learning environment on the development of future doctors' ethical reflection is realised through the interaction of several interrelated mechanisms: problematising moral choice, contextualising the professional situation, dialogic interpretation, reflective distancing, comparison of alternatives, feedback, integration of professional knowledge and value-based judgement, personalisation of professional experience and a gradual transition to internal self-regulation (Skinner *et al.*, 2024). Within this logic, digital technologies take on significance not only as learning tools but also as means of supporting the future doctor's internal professional development. This requires defining the pedagogical conditions under which the ethical and reflective potential of these technologies can be realised in professional training.

Pedagogical conditions for the effective use of educational technologies in the digital learning environment

The theoretical substantiation of educational technologies and the pedagogical mechanisms through which they influence the formation of ethical reflection in future doctors naturally leads to the need to identify the conditions under which this potential can be realised in professional training. Digital tools or interactive forms of learning interaction do not, in themselves, ensure an automatic value-based and reflective outcome. The effectiveness of these tools and forms of interaction depends on the pedagogical logic into which they are embedded, the content they bring into focus, and whether they support the transition from external learning activity to the inner understanding of professional responsibility (Ursin *et al.*, 2024). For this reason, the question of pedagogical conditions is crucial to understanding the circumstances under which the digital learning environment genuinely becomes a space for the formation of ethical reflection in future doctors.

Above all, the pedagogically grounded selection of digital tools, aligned with the aim of fostering ethical reflection, is fundamental. In the professional education of future doctors, digital technologies are often introduced for reasons of convenience, modernisation of the educational process, or broader access to learning materials. However, when the issue is ethical and reflective development, what becomes decisive is not the technological novelty of the tool, but its ability to organise morally significant learning activity (Kalbus *et al.*, 2024; Ursin *et al.*, 2024). This means that the choice of a digital platform, simulation resource, or discussion format should be determined not only by technical capabilities but, above all, by whether the tool stimulates analysis of a value-laden situation, argumentation, and self-correction. Only under such conditions does technology acquire pedagogical direction.

Equally important is the inclusion of professionally significant situations with a clear ethical dimension in the learning content. Ethical reflection does not develop on material devoid of moral tension, value ambiguity, or communicative complexity. For the development of ethical reflection, future doctors need to engage with situations in which professional decisions require choosing among several possible courses of action and attending to patient dignity, confidentiality, autonomy, trust, psychological condition, family interests, the risks of intervention, and the tension between clinical expediency and human sensitivity (Tokumasu *et al.*, 2024; Young *et al.*, 2024). If digital educational materials are limited to informative or algorithmic content, they may be useful for knowledge formation, but they do not provide a sufficient basis for ethical understanding.

For this reason, the digital learning environment should include learning situations that involve students in moral analysis, the justification of choice and reflection on the possible consequences of a professional decision.

Another essential condition is the teacher's moderation and pedagogical support. The digital environment considerably expands opportunities for students' independent work, but this does not mean that the process of forming ethical reflection can be left entirely to itself. Ethical understanding of a professional situation requires not only individual activity, but also pedagogical guidance that helps students identify significant aspects of the situation, pose important questions, avoid simplistic conclusions, broaden the analytical perspective, and reach the level of reasoned moral judgement (Nychkalo & Gutor, 2024). The teacher's role lies not in imposing ready-made evaluations, but in creating a space for understanding in which students move from superficial reaction to deeper interpretation of professional experience. For this reason, the pedagogical effectiveness of digital technologies depends largely on the professional moderation of discussions and support for students' reflective activity.

A necessary condition is the creation of a safe educational space for expressing positions, doubt, and error. Ethical reflection does not develop under conditions of fear of giving the 'wrong' answer or being judged for ambiguous reasoning. For future doctors to learn to understand the moral complexity of professional decisions, they must have the opportunity to make assumptions, doubt, revise a personal position, acknowledge the limits of a chosen perspective, and analyse errors without the risk of humiliation or formal devaluation. In the digital environment, this condition becomes especially important, since online communication may both expand the space for reflection and create additional tension. Students, therefore, need to perceive reflective activity not as a test of errorlessness, but as a space for professional growth.

An important condition is the combination of individual and group reflection. Ethical understanding of a professional situation has both an inner and a dialogic dimension. On the one hand, students need time for personal reflection on the situation, for articulating a personal position, identifying doubts, and internally relating the decision to personal value orientations. On the other hand, it is equally important that they have the opportunity to compare their views with those of others, see different ways of interpreting the situation, encounter alternative argumentation, and refine personal judgement in dialogue (Leung & Peisah, 2023). The most effective forms of organising learning interaction are those in which personal interpretation of a professional situation is combined with subsequent dialogic clarification of a personal position. Such a combination makes it possible to avoid both superficial collective reaction and the closed nature of purely individual reflection.

No less important is the systematic use of educational technologies in forming ethical reflection. This quality does not emerge as an immediate result of participation in a single case, simulation, or discussion. It develops gradually through students' repeated involvement in different forms of moral analysis, professional choice, argumentation, and self-correction (Sadeq *et al.*, 2025). Occasional ethical-reflective tasks may arouse interest, but they do not ensure stable inner development. The effectiveness of digital educational technologies increases when they are integrated into the overall logic of professional training, recur at different stages of learning, and gradually become more complex. It is precisely this systematicity that allows ethical reflection to move from the sphere of one-off educational experience to that of a stable professional disposition.

Equally important is integrating ethical content into the overall structure of professional training. The development of ethical reflection cannot be effective if it remains confined to a single discipline, such as medical ethics or deontology. In real professional practice, the moral dimension is present in clinical decision-making, communication, diagnostic choice, and interactions with patients and the team; therefore, in professional education, it should likewise be integrated into different learning contexts. Technologies within the digital learning environment become more pedagogically effective when the ethical component is embedded in various forms of professionally oriented learning activity rather than functioning separately from the core professional content. Such integration helps students perceive ethical reflection as a natural part of doctors' professional thinking.

Particular attention should also be paid to assessments that focus not only on the result, but also on the student's reasoning process. If only the final answer is assessed in the educational process, students often orient themselves towards reproducing the expected result rather than developing a deep understanding of the professional situation (Tokumasu *et al.*, 2024; Gupta & Chaudhuri, 2025). For the formation of ethical reflection, it is important that attention should also be given to the logic of analysis: whether students considered the value-based aspects of the situation, alternatives, and the possible consequences of the decision. This is especially important in the digital learning environment, since digital tools make it possible to capture not only the final answer, but also the course of the student's work. Such a shift in assessment emphasis makes learning less formal and more supportive of value-based and professional development.

The final, though no less important, condition is coherence between technological form and the humanistic orientation of medical education. The digitalisation of the professional training of future doctors should not lead to the depersonalisation of the educational process, the reduction of the patient to a set of clinical data, or the substitution of professional responsibility with technical proficiency. On the contrary, the use of educational technologies should strengthen attention to the human dimension of the medical profession and its ethical complexity. This means that the digital learning environment should be designed

so that technology does not distance students from the profession's moral meaning but helps them see and interpret it more deeply. Only under this condition does digital educational infrastructure remain aligned with the humanistic orientations of medical education.

The effective use of technologies within the digital learning environment to develop future doctors' ethical reflection is possible when a set of interrelated pedagogical conditions is in place: the purposeful selection of digital tools, ethically rich learning content, teachers' pedagogical support, a safe space for reflection, the combination of individual and group work, systematic use, the integration of the ethical component into professional training, assessment focused on the reasoning process and the alignment of digital form with the humanistic content of the medical profession (Gupta & Chaudhuri, 2025; Sadeq *et al.*, 2025). Taken together, these conditions transform the digital learning environment into a pedagogical resource for the professional and value-based development of future doctors. The main components of the pedagogical logic of forming ethical reflection in future doctors within the digital learning environment are systematised in Table 1.

Table 1. The pedagogical logic of forming ethical reflection in future doctors within the digital learning environment

Component of the conceptual framework	Content	Pedagogical function	Expected ethical-reflective outcome
Digital learning environment	Interactivity, modelling of professionally significant situations, asynchronous reflection, multimodality, feedback	Creates a pedagogically organised space for professional and value-based development	Students' engagement in morally significant situations and understanding of professional decisions
Educational technologies	Case-based, problem-based, simulation-based, reflective, portfolio-based, discussion-based and feedback-oriented formats of learning interaction	Organise students' intellectual and value-based activity	Transition from acquiring ethical information to active moral understanding of professional action
Pedagogical mechanisms	Problematisation of moral choice, contextualisation of the situation, dialogic understanding, reflective distancing, comparison of alternatives, personalisation of professional experience, self-correction	Transform external learning activity into inner ethical work	Development of moral judgement, professional self-awareness, and a reflective position
Pedagogical conditions	Pedagogically grounded selection of digital tools, ethically rich content, teacher guidance, safe reflective space, combination of individual and group work, systematicity, integration of the ethical component, assessment oriented towards the reasoning process	Ensure the effectiveness of the ethical-reflective influence of educational technologies	Stable integration of ethical reflection into the logic of the professional training of future doctors
Practical educational outcome	Inner professional responsibility, moral understanding of clinical decisions, capacity for reflective self-correction	Captures the pedagogical outcome of digital professional training	Formation of an ethically sensitive, reflective, and professionally mature future doctor

Source: developed by the author based on K.C.Y. Leung & C. Peisah (2023), R. Leyland *et al.* (2024), S.S. Guraya *et al.* (2024), D.K. Gupta & A. Chaudhuri (2025), Y. Zhu *et al.* (2026)

As shown in Table 1, the ethical-reflective potential of the digital learning environment is realised not through any single tool but through the interconnections among the environment, educational technologies, pedagogical mechanisms, and the conditions for the effective use of these technologies. It is this logic that provides the basis for defining the practical significance of the results obtained.

Practical significance of the research findings

The findings may serve as a methodological and applied reference point for designing contemporary professional training at medical higher education institutions. First of all, this concerns the purposeful integration of the ethical and reflective component into educational content, professionally oriented learning situations, tasks for independent reflection and models of pedagogical support for students.

In practical terms, the research results can be used in several specific forms of educational practice. The identified educational technologies may serve as a basis for designing digital modules on medical ethics and professionalism. The theoretically justified pedagogical mechanisms can be used to develop clinically and ethically oriented cases, simulation scenarios with elements of moral choice, and virtual patient tasks that require students to justify professional decisions. The defined pedagogical conditions may guide the organisation of online discussions, feedback, peer assessment and reflective writing tasks in digital courses. In addition, the proposed understanding of ethical reflection may be used to develop assessment rubrics for evaluating students' ethical reasoning and methodological recommendations for teachers who support future doctors' professional and value-based development.

The proposed provisions help reorient the use of digital educational technologies in medical education from a predominantly instrumental and didactic plane to a value-based and professional plane of student development. Under this approach, the digital educational infrastructure appears not only as a technical means of organising learning but also as a pedagogically guided resource for

developing internal professional responsibility, moral judgement and reflective self-correction.

The findings should be taken into account when developing educational programmes and teaching and methodological support for disciplines related to the professional training of future doctors. This involves designing educational and methodological support so that the ethical component is embedded in the logic of professional thinking, situational analysis, and responsible decision-making, rather than being isolated from professional content. Such an approach is particularly important where student training requires not only mastery of clinical action algorithms, but also the development of readiness to make responsible decisions under conditions of moral ambiguity.

The results obtained are also of particular value for the training and professional development of teachers in medical higher education institutions. The identified pedagogical mechanisms and conditions may serve as reference points in the selection of digital tools, the structuring of professionally significant situations, the organisation of discussion, the design of feedback, and the assessment of the logic of moral reasoning. In this sense, the study is also relevant to improving actual pedagogical practice under conditions of the digitalisation of medical education.

In addition, the formulated provisions may serve as a conceptual basis for the further development of criteria, indicators, and diagnostic tools to assess the development of ethical reflection among future doctors in the digital learning environment. Thus, the practical significance of the study lies in improving the content, technologies, and pedagogical organisation of the professional training of future doctors in line with the contemporary challenges of digital education and the humanistic orientations of the medical profession.

Discussion of the findings in relation to current research

The results obtained are consistent with current studies in which the digitalisation of medical education is viewed not only as an update of learning tools but also as a change in the pedagogical logic of professional training. O.I. Kalbus *et al.* (2024) examined the use of digital solutions in training future healthcare professionals and concluded that the digital environment expands the possibilities for learning interactions but requires pedagogically motivated implementation. N. Zarifsanaiey *et al.* (2024) also noted that the effectiveness of digital educational technologies increases when students are actively engaged. This position is supported, but it also requires clarification: students' activity should be not only cognitive but also value-based and reflective.

Comparison with studies on case-based and problem-based learning is also important. R. Al-Bedaery *et al.* (2024) examined the humanisation of case-based learning and demonstrated that working with clinical cases brings learning closer to the real complexity of medical practice. B. Wei *et al.* (2024) studied problem-based learning in medical training and found that this approach encourages students to think independently, work with uncertainty, and seek justified decisions. This conclusion is expanded in the present study: problem-based learning is important not only for clinical reasoning but also for developing ethical reflection, since professional uncertainty often involves tensions between values, risks and professional responsibility. Y. Ota *et al.* (2026) also emphasised the importance of problem-based formats for developing active professional thinking. This position is consistent with the result obtained, but it needs to be supplemented by an ethical and reflective dimension.

The results of the study are partly supported by works on simulation-based learning. P.D. Gyamo & S. Kesari (2024) showed that simulation creates safe conditions for practising clinical actions and reduces the risk of error in real practice. This conclusion is supported; however, to develop ethical reflection, simulation should go beyond technical training and include communicative complexity, moral ambiguity and analysis of the consequences of decisions. A. Hamilton (2024) examined the impact of artificial intelligence on simulation-based learning and noted that intelligently supported environments can change the nature of educational interaction. L. Weidener & M. Fischer (2023) also highlighted the potential of digital tools to structure students' thinking, which is consistent with the conclusion that reflective learning requires a pedagogically controlled logic.

A separate group consists of studies on reflective practices. S. Sarraf-Yazdi *et al.* (2024) analysed the importance of reflection for developing the professional self-awareness of future doctors and showed that reflective activity contributes to a deeper interpretation of experience. This corresponds to the results obtained, in which ethical reflection is considered an integrative pedagogical outcome. C. Skinner *et al.* (2024) concluded that reflective approaches are effective when they are linked to a real or simulated professional context. A. Sydoryako & S. Sydoryako (2023) emphasised the role of reflection in the transition from externally imposed requirements to personal professional development, which aligns with the conclusion that ethical reflection supports the shift towards internal ethical self-regulation.

Comparison with studies on ethics and professionalism also confirms the relevance of the results obtained. L.M. Bashkirova *et al.* (2025) analysed interactive approaches to teaching medical ethics and emotional intelligence and concluded that ethics education should rely on students' active participation, discussion of situations and development of empathy. This is consistent with the proposed interpretation of dialogue understanding, personalisation of professional experience, and pedagogically organised feedback. K. Tokumasu *et al.* (2024) highlighted the complexity of moral choice in medical practice and the need to develop the ability to analyse the consequences of professional decisions. These findings align with the position that problematising moral choice is a key mechanism

for developing ethical reflection. P.D. Young *et al.* (2024) showed that a doctor's professional decision cannot be reduced to technical correctness. This supports the understanding of ethical reflection as the ability to relate clinical appropriateness to the profession's humanistic principles.

At the same time, the results of the study help clarify certain positions in literature. A. Sadeq *et al.* (2025) emphasised the importance of professional responsibility and ethical judgement in the training of future doctors, but this analysis is more focused on the content of professional ethics. In the present study, the emphasis shifts to the pedagogical conditions and mechanisms that enable students to internalise ethical requirements. F. Ursin *et al.* (2024) studied the challenges of digitalising medical education and highlighted the risk of the formal use of digital tools. This caution is supported, as the pedagogical organisation of the digital environment determines whether it becomes a space for professional and value-based development. L. Lytvynchuk & O. Okhrimenko (2025) emphasised the importance of humanistic guidelines in the professional training of future medical specialists. The results obtained complement this approach by showing how humanistic content can be integrated into digital forms of learning interaction.

The synthesis of the analysed sources confirms that modern medical education needs not simply an expansion of digital tools but their pedagogically meaningful use. For this reason, the proposed approach refines existing interpretations: ethical reflection is considered not as a separate humanitarian component but as the outcome of specifically organised work with professional situations, moral choice, and reflective self-correction in the digital learning environment.

CONCLUSIONS

The potential of educational technologies in the digital learning environment to develop future doctors' ethical reflection was theoretically justified in relation to their capacity to organise moral choice, professional dialogue, case analysis, feedback, and reflective self-correction. The study made it possible to view the digital learning environment not only as the technical infrastructure of the educational process but also as a pedagogically organised space that combines professional content, the modelling of clinically significant situations, communication, feedback and reflective interpretation of professional experience.

Future doctors' ethical reflection was defined as an integrative outcome of professional training, manifested in the ability to recognise the moral content of a professional decision, analyse value-based contradictions, relate clinical appropriateness to the humanistic principles of medical practice and correct a personal professional position. It was shown that such reflection is not formed through the simple assimilation of ethical norms but requires students' involvement in pedagogically organised situations of moral choice, argumentation, dialogue and self-correction. The study established that the greatest ethical and reflective potential lies in educational technologies that provide a professional context, problem-based learning, variability in decision-making, analysis of consequences, dialogic interaction and opportunities to return to previous judgement. The influence of these technologies is realised through the interaction of pedagogical mechanisms: problematising moral choice, contextualising the professional situation, reflective distancing, comparing alternatives, pedagogically organised feedback, personalising professional experience and a gradual transition to internal ethical self-regulation.

The effectiveness of using the digital learning environment to develop ethical reflection depends on a set of pedagogical conditions: the purposeful selection of digital tools, ethically rich content, teacher support, a safe space for expressing a personal position and analysing mistakes, the combination of individual and group reflection, systematic work, the integration of the ethical component into professional training and assessment focused on the logic of students' reasoning. The results obtained can be used to improve digital educational practices in medical higher education institutions. Further research should focus on empirically verifying the proposed provisions and developing criteria for assessing the formation of future doctors' ethical reflection.

ACKNOWLEDGEMENTS

None.

FUNDING

None.

CONFLICT OF INTEREST

None.

REFERENCES

[1] Al-Bedaery, R., Baig, S., Khare, Y., & Sullivan-McHale, J. (2024). Humanising case-based learning. *Medical Teacher*, 46(10), 1348-1355. doi: 10.1080/0142159X.2024.2308066.

[2] Bashkirova, L.M., Hryshchuk, M.I., & Novitska, I.V. (2025). Innovative approaches to teaching medical ethics and emotional intelligence through interactive technologies. *Pedagogical Academy: Scientific Notes*, 17. doi: 10.5281/zenodo.15236088.

[3] Çetinkaya, L., Keser, İ., Yildirim, S., & Keser, H. (2024). The effect of case-based mobile virtual patient application on students' academic achievement in clinical reasoning skills. *Medical Education Online*, 29(1), article number 2322223. doi: 10.1080/10872981.2024.2322223.

[4] Dos Santos, L.R.A., de Oliveira, A.M., Costa Dos Santos, L.M.A., Aguilar, G.J., Lemos Costa, W.D., de Castro Barros Donato, D., & Bollela, V.R. (2024). Collaborative development of an electronic portfolio to support undergraduate medical education: Design and development study. *JMIR Medical Education*, 10, article number e56568. doi: 10.2196/56568.

[5] Gupta, D.K., & Chaudhuri, A. (2025). Strengthening ethics and professionalism in medical education: A systematic review with thematic analysis of educational approaches. *Archives of Medicine and Health Sciences*, 13(3), 459-469. doi: 10.4103/amhs.amhs_131_25.
[6] Guraya, S.S., Rashid-Doubell, F., Harkin, D.W., & Guraya, S.Y. (2024). Mission-driven e-professionalism in the medical field: Shaping digital identity and virtual engagement. *Frontiers in Medicine*, 11, article number 1276839. doi: 10.3389/fmed.2024.1276839.
[7] Gyamo, P.D., & Kesari, S. (2024). The role of simulation in medical education: A review article. *Indian Journal of Health Sciences and Care*, 11(3), 103-107. doi: 10.4103/IJHSC.IJHSC_17_25.
[8] Hamilton, A. (2024). Artificial intelligence and healthcare simulation: The shifting landscape of medical education. *Cureus*, 16(5), article number e59747. doi: 10.7759/cureus.59747.
[9] Heydari, S., & Beigzadeh, A. (2024). Medical students' perspectives of reflection for their professional development. *BMC Medical Education*, 24, article number 1399. doi: 10.1186/s12909-024-06401-2.
[10] Kalbus, O.I., Shastun, N.P., & Makarov, S.O. (2024). Digital tools in modern higher medical education: Prospects and challenges in the XXI century. *Perspectives and Innovations of Science*, 5(39), 1221-1232. doi: 10.52058/2786-4952-2024-5(39)-1221-1232.
[11] Leung, K.C.Y., & Peisah, C. (2023). A mixed-methods systematic review of group reflective practice in medical students. *Healthcare*, 11(12), article number 1798. doi: 10.3390/healthcare11121798.
[12] Leyland, R., Heath, M., Collett, T., Drake, E., & Neve, H. (2024). "How far I've come": The value of reviewing past written reflections. *Reflective Practice*, 25(6), 826-838. doi: 10.1080/14623943.2024.2406969.
[13] Lytvynchuk, L., & Okhrimenko, O. (2025). Psychological factors of the formation of ethical competence in the public activity of a doctor. *Scientific Perspectives*, 11(65), 2430-2436. doi: 10.52058/2708-7530-2025-11(65)-2430-2436.
[14] Nychkalo, N., & Gutor, L. (2024). Communication aspects in deontological education of medical students in Ukraine: Traditional and digital learning tools. *Education: Modern Discourses*, 7, 104-113. doi: 10.37472/2617-3107-2024-7-10.
[15] Ogundiya, O., Rahman, T.J., Valnarov-Boulter, I., & Young, T.M. (2024). Looking back on digital medical education over the last 25 years and looking to the future: Narrative review. *Journal of Medical Internet Research*, 26, article number e60312. doi: 10.2196/60312.
[16] Ota, Y., Asada, Y., Kubo, S., Kanno, T., Yagi, M.S., & Matsuyama, Y. (2026). Evaluation of a problem-based learning program's effect on medical students' competencies in understanding legal and ethical AI-related issues. *JMIR Medical Education*, 12, article number e84535. doi: 10.2196/84535.
[17] Pavliukovych, N., Pavliukovych, O., Korotun, O., & Bilous, V. (2026). The use of virtual patients in medical education: Implementation methodology and effectiveness assessment. *Educational Discourses*, 1, 55-61. doi: 10.32782/eddiscourses/2026-1-8.
[18] Polkovnikov, Y.O. (2024). Features of professional culture formation of future dentists at the initial stage of professional training. *Perspectives and Innovations of Science*, 5(39), 408-418. doi: 10.52058/2786-4952-2024-5(39)-408-418.
[19] Sadeq, A., *et al.* (2025). Medical professionalism education: A systematic review of interventions, outcomes, and sustainability. *Frontiers in Medicine*, 12, article number 1522411. doi: 10.3389/fmed.2025.1522411.
[20] Sarraf-Yazdi, S., Pisupati, A., Goh, C.K., Ong, Y.T., Toh, Y.R., Goh, S.P.L., & Krishna, L.K.R. (2024). A scoping review and theory-informed conceptual model of professional identity formation in medical education. *Medical Education*, 58(10), 1151-1165. doi: 10.1111/medu.15399.
[21] Shah, M.H., Mishra, P., & Smyth, M. (2023). Reflective practices in medical education: Fostering social responsibility and developing students' social consciousness. *Advances in Physiology Education*, 47(4), 737-742. doi: 10.1152/advan.00106.2023.
[22] Simou, E. (2025). The growing importance of soft skills in medical education in the AI era: Balancing humanistic care and artificial intelligence. *International Medical Education*, 4(4), article number 50. doi: 10.3390/ime4040050.
[23] Skinner, C., Valentin, K., Davin, L., Leahy, T., & Berlach, L. (2024). Shaping minds and hearts in medical education: Embedding and implementing a personal and professional development curriculum. *Medical Teacher*, 46(12), 1544-1552. doi: 10.1080/0142159X.2024.2409283.
[24] Sydoryako, A., & Sydoryako, S. (2023). Features of education of postgraduate physicians in extreme conditions. *ScienceRise: Pedagogical Education*, 3(54), 32-35. doi: 10.15587/2519-4984.2023.281845.
[25] Tokumasu, K., Va, P., Obara, H., & Rucker, L. (2024). What medical students and residents learned from reflection through patients' perspectives: A qualitative study. *International Journal of Medical Education*, 15, 150-158. doi: 10.5116/ijme.6741.f16c.
[26] Ursin, F., Müller, R., Funer, F., Liedtke, W., Renz, D., Wiertz, S., & Ranisch, R. (2024). Non-empirical methods for ethics research on digital technologies in medicine, health care and public health: A systematic journal review. *Medicine, Health Care and Philosophy*, 27, 513-528. doi: 10.1007/s11019-024-10222-x.

[27] Wei, B., Wei, B., Liu, Y., Wu, Y., Wang, M., Pan, S., & Xu, Y. (2024). Effectiveness of problem-based learning on development of nursing students' critical thinking: A systematic review and meta-analysis. *Nurse Education Today*, 133, article number 106051. doi: 10.1016/j.nedt.2023.106051.
[28] Weidener, L., & Fischer, M. (2023). Teaching AI ethics in medical education: A scoping review of current literature and practices. *Perspectives on Medical Education*, 12(1), 399-410. doi: 10.5334/pme.954.
[29] Young, P.D., Papanikitas, A.N., & Spicer, J. (2024). Medical ethics education as translational bioethics. *Bioethics*, 38(3), 262-269. doi: 10.1111/bioe.13257.
[30] Zarifsanaiey, N., Farrokhi, M.R., Karimian, Z., Hoseini, S., Chahartangi, F., & Raeisi Shahraki, H. (2024). Lesson learned from assessing teachers' and students' perspectives regarding the quality of e-learning in medical education during the pandemic: A mixed-methods study. *BMC Medical Education*, 24, article number 171. doi: 10.1186/s12909-024-05160-4.
[31] Zhu, Y., McInnis, B., Punater, T., York, B., & Nebeker, C. (2026). Educating students about digital health research ethics: Curricula review and expert interview study. *Journal of Medical Internet Research*, 28, article number e82861. doi: 10.2196/82861.

Юлія Євтушенко
Кандидат педагогічних наук, доцент
Державний заклад «Луганський державний медичний університет»
33028, вул. 16 Липня, 36, м. Рівне, Україна
http://orcid.org/0000-0002-7315-3337

Освітні технології формування етичної рефлексії майбутніх лікарів у цифровому навчальному середовищі

Анотація. Цифрове навчальне середовище в медичній освіті дедалі більше впливає не лише на організацію навчального процесу, а й на професійне та ціннісне становлення майбутнього лікаря. Метою статті було теоретично обґрунтувати потенціал освітніх технологій цифрового навчального середовища у формуванні етичної рефлексії майбутніх лікарів, а також визначити педагогічні механізми й умови ефективного використання цих технологій у професійній підготовці. Методологія дослідження ґрунтувалася на поєднанні компетентнісного, аксіологічного, особистісно орієнтованого, рефлексивного та середовищного підходів. Використано теоретичний і порівняльний аналіз, систематизацію, узагальнення, інтерпретацію та теоретичне осмислення наукових положень. Встановлено, що цифрове навчальне середовище доцільно розглядати не лише як технічну інфраструктуру навчання, а як педагогічно організований простір професійного й ціннісного становлення майбутнього лікаря. З'ясовано, що етична рефлексія є інтегративним результатом професійної підготовки, який виявляється у здатності осмислювати моральний зміст професійних рішень, аналізувати ціннісні суперечності клінічних ситуацій, співвідносити професійну доцільність із гуманістичними орієнтирами лікарської діяльності та коригувати власну професійну позицію відповідно до етичних вимог професії. Визначено, що найбільший потенціал для її формування мають аналіз клінічних випадків, проблемно-орієнтоване навчання, симуляційне навчання, технологія віртуального пацієнта, рефлексивне письмо, електронне портфоліо, модерована онлайн-дискусія та педагогічно організовані технології зворотного зв'язку. Теоретично обґрунтовано педагогічні механізми впливу цих технологій, зокрема проблематизацію морального вибору, контекстуалізацію професійної ситуації, діалогічне осмислення, рефлексивне дистанціювання, зіставлення альтернатив, інтеграцію професійного знання і ціннісного судження, персоналізацію професійного досвіду та перехід до внутрішньої етичної саморегуляції. Визначено педагогічні умови ефективного використання цих технологій у цифровому навчальному середовищі. Практичне значення полягає в можливості використання результатів дослідження для проєктування цифрових курсів, клінічних кейсів, симуляційних сценаріїв, рефлексивних завдань і моделей педагогічного супроводу в системі професійної підготовки майбутніх лікарів

Ключові слова: моральне судження; професійна саморегуляція; клінічне рішення; ціннісно орієнтоване навчання; медична освіта; професійна підготовка; педагогічні умови

UDC 070:378.016:004.77
DOI: 10.52534/msu-pp2.2026.35

ISSN 2413-3329
E-ISSN 2520-6788

Alisa Mykolaichuk*
PhD in Philology, Associate Professor
Taras Shevchenko National University of Kyiv
01033, 60 Volodymyrska Str., Kyiv, Ukraine
https://orcid.org/0000-0003-2073-1954

Digital transformation of journalism education through a pedagogical and technological lens

Article's History:
Received: 24.11.2025
Revised: 30.03.2026
Accepted: 25.05.2026
Published: 29.06.2026

Suggested Citation:
Mykolaichuk, A. (2026). Digital transformation of journalism education through a pedagogical and technological lens. *Scientific Bulletin of Mukachevo State University. Series "Pedagogy and Psychology"*, 12(2), 35-46. doi: 10.52534/msu-pp2.2026.35.

*Corresponding author
(alisa.mykolaichuk@knu.ua)

Abstract. Contemporary journalism education is undergoing transformation under the influence of digital media ecosystems, platform communication, data-driven news production, and artificial intelligence; however, the integration of digital literacy, ethical reasoning, professional values, and resilience-oriented competencies in curricula remains insufficiently systematised. The purpose of the study was to analyse pedagogical and technological dimensions of journalism education transformation in the digital media era and to substantiate an integrated competency-oriented framework for professional training. The research used historical-pedagogical analysis, comparative analysis, and a systemic approach. The empirical basis consisted of recent peer-reviewed publications and selected curriculum materials representing different regional contexts. The study identified three stages in the development of journalism education: industrial newsroom-centred training, multimedia journalism education, and digital journalism education shaped by artificial intelligence, data analytics, and algorithmic communication. The results showed that contemporary journalism curricula increasingly combined classical professional values with digital storytelling, data journalism, audience analytics, artificial intelligence literacy, verification culture, and ethical decision-making. The comparative analysis demonstrated that European models mainly emphasised responsible innovation and interdisciplinary learning, Turkish programmes reflected policy-driven technological modernisation, whereas Ukrainian journalism education combined digital competencies with resilience-oriented preparation under conditions of information warfare and crisis communication amidst the full-scale invasion and russia's war against Ukraine. The practical value of the study lay in clarifying competency blocks and pedagogical priorities that can be used for curriculum renewal, course design, and the development of future empirical research on artificial intelligence integration in journalism education

Keywords: curriculum modernisation; digital pedagogy; artificial intelligence literacy; higher education; professional competencies; crisis communication

INTRODUCTION

The rapid expansion of digital technologies has reshaped the professional role of journalists and transformed the educational requirements for journalism training. Journalism is no longer limited to traditional newsroom routines, print-centred communication models, or linear forms of news production. Contemporary journalistic practice develops within digital media ecosystems shaped by multimedia storytelling, platform infrastructures, data analytics, algorithmic distribution, automated content production, and artificial intelligence. These changes directly affect journalism education and require universities to reconsider not only the content of professional training but also curriculum design, pedagogical strategies, competency models, and ethical preparation.

Recent research has increasingly examined how journalism education responds to digital and AI-mediated

Copyright © The Author(s). This is an open access article distributed under the terms of the Creative Commons Attribution License 4.0 (https://creativecommons.org/licenses/by/4.0/)

professional change. M.S. Hossain & D. Wenger (2024) analysed whether journalism education has kept pace with digital transformation, while M.S. Wenger *et al.* (2025) showed that AI affects not only newsroom skills but also curriculum design, ethical preparation, faculty readiness, and institutional decision-making. V. Katzenberger (2024) focused on the gap between digital skills and journalism curricula, whereas M. Severijnen & Y. de Haan (2024) proposed future-oriented scenarios for journalism education in a changing media landscape. Together, these studies indicate that journalism education modernisation should be understood not merely as the addition of new technological subjects but as a broader transformation of professional competencies and pedagogical models. Artificial intelligence has become one of the most influential factors in this transformation. Generative artificial intelligence (AI) tools are increasingly used in newsroom routines, media education, content production, and experimental forms of digital storytelling (Pavlik, 2023; Cools & Diakopoulos, 2024; Sánchez-García *et al.*, 2025). At the same time, AI integration creates new pedagogical and ethical challenges. Journalism students must learn not only how to use AI-supported tools efficiently but also how to evaluate their limitations, identify algorithmic bias, ensure transparency, avoid misinformation, and preserve professional responsibility in automated or semi-automated communication environments (Miao & Holmes, 2023; Porlezza & Schapals, 2024).

The development of artificial intelligence in education also highlights a broader pedagogical issue. In recent journalism and media research, AI literacy has increasingly been conceptualised as a professional, critical, and ethical competence. M. Jaakkola & J. Wiik (2025) showed that journalism educators' preparedness to teach AI depends not only on technical knowledge but also on the pedagogical domestication of AI tools within existing educational structures. T. Hollanek *et al.* (2025) further emphasised critical AI literacy as a condition of responsible reporting, transparency, and public accountability in AI-mediated media environments. Therefore, AI literacy in journalism education should be interpreted not as an isolated technical skill but as a multidimensional professional competence that combines technical awareness, critical evaluation, ethical reasoning, and responsible application. This is especially relevant to journalism education, where digital tools must be connected with professional values such as accuracy, verification, independence, public accountability, and ethical responsibility.

The problem addressed in this study is that, although digital media and artificial intelligence have become central to contemporary journalism practice, journalism education still lacks an integrated pedagogical framework that connects technological training, ethical reasoning, data-oriented competencies, and resilience-oriented professional preparation. Existing research has often examined digital skills, data journalism, AI-assisted media production, curriculum modernisation, or media ethics as separate areas. However, these dimensions are not always considered as interconnected components of a holistic educational model. As a result, the relationship between technological competencies, pedagogical strategies, professional values, and the changing identity of future journalists remains insufficiently systematised. This problem is particularly significant in the Ukrainian context. Ukrainian journalism education develops under the simultaneous influence of global digital transformation and the specific challenges of wartime communication, information warfare, disinformation, digital instability, and crisis reporting. Recent Ukrainian studies emphasise the growing importance of fact-checking, verification culture, related to open-source intelligence (OSINT) practices, AI-assisted learning, ethical responsibility, and resilience-oriented competencies in the training of future journalists. Thus, the Ukrainian case demonstrates that journalism education must prepare students not only for technologically advanced media production but also for responsible professional activity in high-risk information environments. International experiences show that journalism education modernisation follows different institutional and regional trajectories. European approaches increasingly emphasise ethical AI integration, interdisciplinary learning, critical media analysis, and responsible innovation. In Türkiye, journalism education reflects a stronger orientation toward policy-driven technological modernisation and the integration of AI-related disciplines into undergraduate and graduate curricula. These differences indicate that journalism education cannot be reduced to a universal set of digital skills. It should instead be analysed as a socio-technical pedagogical system shaped by technological change, institutional structures, professional cultures, and socio-political contexts.

The study aimed to analyse the pedagogical and technological dimensions of journalism education transformation in the digital media era and to substantiate an integrated competency-oriented framework for professional training. The objectives of the research were: to identify the major stages in the evolution of journalism education under the influence of digital media, data-driven communication, and artificial intelligence; to determine the key competency blocks required for contemporary journalism education, including traditional journalistic, digital, data-oriented, AI-related, ethical, and resilience-oriented competencies; to clarify the pedagogical logic of integrating these competencies into curriculum design, learning activities, and selected international models of journalism education modernisation.

MATERIALS AND METHODS

This study used a qualitative conceptual and comparative research design. It examined the transformation of journalism education under the influence of digital media ecosystems, artificial intelligence, data-driven communication, and changing professional requirements. The design was aligned with three research objectives: identifying the main stages of journalism education transformation, determining the key competency blocks required for contemporary

journalism training, and clarifying the pedagogical logic of integrating these competencies into curriculum design and learning activities. The study was not based on a survey, experiment, or statistical measurement. Instead, it relied on structured qualitative analysis of scholarly literature and selected institutional examples in order to identify conceptual patterns, competency transformations, pedagogical strategies, and regional differences in journalism education modernisation. The methodological framework combined historical-pedagogical analysis, comparative analysis, and a systemic approach. Historical-pedagogical analysis was used to trace the evolution of journalism education from industrial newsroom-centred training to multimedia and digital or AI-mediated models. Comparative analysis was applied to identify similarities and differences in journalism education modernisation across selected regional contexts. The systemic approach made it possible to conceptualise journalism education as a socio-technical pedagogical system shaped by the interaction of educational institutions, professional standards, digital technologies, artificial intelligence, ethical norms, and socio-political conditions.

The analytical basis of the study consisted of peer-reviewed scholarly publications, academic books, international reports, and selected curriculum materials related to journalism education, digital pedagogy, artificial intelligence literacy, data journalism, media ethics, and higher education transformation. The core literature was selected primarily from publications issued between 2019 and 2026, with priority given to recent studies published between 2022 and 2026. Earlier sources were included only when they provided foundational concepts relevant to journalism transformation, artificial intelligence in education, or algorithmic media systems. Sources were selected according to four inclusion criteria: relevance to journalism or media education; focus on digital, AI-related, data-oriented, ethical, or curriculum transformation; academic or institutional credibility; and usefulness for comparing different educational contexts. Publications were excluded if they focused only on general media industry trends without educational implications, described AI tools without connection to journalism training, lacked academic reliability, or duplicated arguments already represented in more relevant sources To ensure consistency between the empirical extraction and the presentation of findings, the selected sources and institutional examples were analysed according to four predefined thematic directions. The first direction involved a historical-pedagogical analysis of journalism education transformation, tracing the shift from industrial to digital and AI-mediated models. The second direction focused on competency restructuring, systematically extracting data to map traditional, digital, data-oriented, AI-related, ethical, and resilience-oriented competencies into a unified pedagogical matrix. The third direction comprised a comparative analysis of regional modernisation patterns across Europe, Türkiye, and Ukraine to identify distinct institutional and pedagogical trajectories. The fourth direction involved the conceptual synthesis of the extracted pedagogical, ethical, and technological components into an integrated educational framework. The analysis was conducted through a structured qualitative coding procedure. The extracted information was grouped strictly according to these four thematic directions, which provided the architectural basis for organising the results. Recurrent themes, differences between contexts, and pedagogical implications were compared across the corpus. This procedure made it possible to move from individual source interpretation to broader conceptual synthesis.

The comparative analysis focused on three selected contexts: Europe, Türkiye, and Ukraine. These contexts were chosen because they represent different trajectories of journalism education modernisation under the influence of digital technologies and artificial intelligence. The European context was analysed as an example of interdisciplinary, research-oriented, and ethically grounded journalism education. To address the methodological consistency of the comparative procedure, the Turkish context was analysed not only through recent scholarly studies but also through selected official curriculum materials from Turkish journalism and communication programmes. In particular, the analysis included journalism-related curricula from Istanbul University, Çukurova University, and Selçuk University. These institutional materials were examined according to the same analytical categories as the European and Ukrainian examples: digital competencies, data-oriented competencies, AI-related competencies, ethical reasoning, resilience-oriented preparation, and pedagogical or curriculum modernisation. Ukraine was examined as a context in which global digital transformation intersects with wartime communication, information warfare, disinformation, crisis reporting, and the need for resilience-oriented professional preparation. The comparison was conducted in four steps. First, selected sources were grouped by region and thematic focus. Second, each group was analysed according to the six analytical categories. Third, the identified features were compared in terms of dominant educational focus, key competencies, pedagogical models, professional values, and major challenges. Fourth, the findings were synthesised into comparative tables and interpretive categories reflecting the transition from industrial and multimedia journalism education toward contemporary digital and AI-mediated professional training. To ensure comparability, the three contexts were interpreted at the same analytical level: as regional examples of journalism education modernisation rather than as exhaustive national mappings of all journalism programmes. In each case, attention was paid to the relationship between technological change, curriculum priorities, competency formation, pedagogical strategies, and socio-political conditions. This approach allowed the comparison to remain focused on pedagogical patterns rather than on institutional statistics.

The study was conducted in five stages: specification of the research problem; formation of the source base according to inclusion and exclusion criteria; historical-pedagogical

analysis of journalism education models; comparative analysis of Europe, Türkiye, and Ukraine; and synthesis of the findings into an integrated competency-oriented interpretation of journalism education transformation. The study had several limitations. It is based on qualitative analysis of scholarly literature and selected institutional examples rather than on surveys, interviews, classroom observations, or quantitative curriculum mapping. Therefore, the findings should be interpreted as conceptual and comparative rather than statistically generalisable. Despite these limitations, the chosen methodology is appropriate for systematising current scholarly discussions, comparing different educational trajectories, and substantiating an integrated pedagogical framework for journalism education in the digital and AI-mediated media environment.

RESULTS

The analysis identified four interrelated results that clarified the transformation of journalism education in the digital media era. First, journalism education developed through historically overlapping models: industrial newsroom-centred education, multimedia journalism education, and contemporary digital or AI-mediated journalism education. Second, this transformation was expressed through the restructuring of professional competencies rather than through the simple addition of technological subjects. Third, Europe, Türkiye, and Ukraine demonstrated different pedagogical logics of modernisation shaped by institutional traditions, policy priorities, technological readiness, and socio-political conditions. Fourth, the findings supported the development of a conceptual pedagogical framework that connected the digital media environment with curriculum transformation, competency blocks, pedagogical strategies, and the expected graduate profile. Evolution of journalism education models**.** The first result was the identification of three major models in the evolution of journalism education. These models should not be understood as strictly separated historical periods because their elements may coexist within contemporary curricula. However, they reflect different dominant logics of professional preparation: the industrial model is based on stable newsroom routines and print-centred professional training; the multimedia model responds to internet-based publishing and online storytelling; and the digital or AI-mediated model is shaped by data journalism, platform logic, artificial intelligence literacy, algorithmic communication, and ethical decision-making in automated or semi-automated media environments (Solkin, 2020; Severijnen & de Haan, 2024; Westlund *et al.*, 2025). Table 1 shows that journalism education has moved from a relatively stable professional model toward adaptive and interdisciplinary training. In the contemporary model, students are expected not only to produce media content but also to understand digital infrastructures, work with data, evaluate AI-supported outputs, and preserve professional values under conditions of technological uncertainty.

Table 1. Evolution of journalism education models

Criteria	Industrial Model	Multimedia Journalism Model	Digital / AI-Mediated Journalism Model
Dominant media environment	Print-dominated mass communication and traditional broadcasting	Internet media, online publishing, multimedia platforms	Hybrid digital ecosystems shaped by platforms, algorithms, data, and artificial intelligence
Core educational focus	Professional routines, writing, editing, and newsroom discipline	Multimedia production, digital storytelling, and online journalism	Data-driven journalism, AI literacy, algorithmic awareness, digital analytics, and ethical responsibility
Main competencies	Writing, editing, verification, interviewing, news judgement	Multimedia storytelling, digital publishing, basic audience engagement, online production	Data interpretation, AI-assisted content production, verification in digital environments, platform analysis, ethical AI use
Pedagogical approach	Apprenticeship-oriented professional training within academic institutions	Integration of digital tools and practical multimedia assignments	Interdisciplinary, project-based, research-informed, and competency-oriented learning
Professional values	Accuracy, objectivity, editorial responsibility, public service	Preservation of traditional values under conditions of technological change	Accuracy, transparency, accountability, independence, algorithmic responsibility, and resilience
Institutional context	Stable media organisations and relatively predictable professional roles	Transitional newsrooms and widening gap between academia and industry	Flexible collaboration between journalism, communication, data analytics, computer science, and digital media fields
Main challenges	Balance between theory and practical training	Rapid technological change and unequal access to digital infrastructure	Misinformation, algorithmic amplification, AI bias, information overload, platform dependency, and ethical risks

Note: the table summarises the transformation of journalism education from newsroom-centred professional training to digital and AI-mediated competency-oriented education
Source: developed by the author based on L. Solkin (2020), J.V. Pavlik (2023), M. Severijnen & Y. de Haan (2024), M.S. Hossain & D. Wenger (2024), V. Katzenberger (2024), H. Cools & N. Diakopoulos (2024), O. Westlund *et al.* (2025)

Competency transformation matrix. The second result concerned the restructuring of competencies required in journalism education. Traditional journalistic competencies remained fundamental, but they were increasingly reinterpreted within platform-based, data-driven, and AI-mediated media environments. The analysis

showed that contemporary journalism education required the integration of traditional, digital, data-oriented, AI-related, ethical, resilience-oriented, and reflective pedagogical competencies. This confirmed that digital transformation should be understood as a multidimensional competency shift rather than as a purely technical modernisation of curricula (Long & Magerko, 2020; Ng *et al*., 2021; Porlezza & Schapals, 2024). Table 2 demonstrates that AI literacy should not be treated only as a technical ability. It includes the capacity to understand, critically evaluate, ethically apply, and professionally contextualise AI-supported tools within journalistic practice. The table also shows how each competency block can be translated into educational activities and assessment-oriented task

Table 2. Competency transformation matrix in journalism education

Competency block	Content of competencies	Educational expression	Professional significance
Traditional journalistic competencies	Writing, editing, interviewing, source evaluation, verification, news judgement, editorial responsibility	Reporting assignments, editing workshops, interviewing practice, newsroom simulations, peer review of journalistic texts, and portfolio-based assessment	Preserves the professional identity of journalism and ensures accuracy, credibility, and public accountability
Digital competencies	Multimedia storytelling, digital publishing, platform communication, content management, audience engagement	Multimedia production projects, online publishing tasks, platform analysis, social media analytics exercises, audience engagement assignments, and reflective evaluation of digital storytelling formats	Enables students to work effectively in contemporary digital media ecosystems
Data-oriented competencies	Data journalism, data interpretation, visualisation, computational thinking, audience analytics, evidence-based storytelling	Data journalism modules, work with open datasets, visualisation assignments, spreadsheet and dashboard exercises, evidence-based storytelling projects, and interpretation of quantitative information	Supports evidence-based reporting and strengthens analytical capacity in complex information environments
AI-related competencies	AI literacy, generative AI use, algorithmic awareness, prompt-based interaction, evaluation of AI outputs, understanding of automation	Practical work with generative AI tools, prompt-based editorial tasks, comparison of human and AI-generated texts, identification of AI errors and bias, evaluation of AI outputs, and reflective justification of AI use	Prepares students to use AI responsibly while understanding its limitations, risks, and professional implications
Ethical and accountability competencies	Transparency, prevention of misinformation, algorithmic bias awareness, responsible AI use, editorial independence, public interest	Media ethics case studies, AI ethics debates, editorial decision-making scenarios, transparency statements, policy analysis, and assessment of risks related to misinformation and algorithmic bias	Protects professional standards in automated and platform-mediated communication environments
Resilience-oriented competencies	Fact-checking, OSINT-related practices, disinformation detection, crisis communication, information security awareness	Verification labs, fact-checking assignments, disinformation analysis, OSINT-related exercises, crisis reporting simulations, digital security tasks, and scenario-based work in unstable information environments	Prepares journalists to operate in high-risk, unstable, or conflict-affected information environments
Pedagogical and reflective competencies	Critical thinking, reflective practice, interdisciplinary learning, collaborative problem-solving, lifelong learning	Project-based learning, interdisciplinary teamwork, reflective journals, learning portfolios, peer feedback, self-assessment, and analysis of professional decision-making in complex media cases	Supports adaptive professional development in rapidly changing media environments

Note: the matrix presents competency blocks that connect technological training with ethical reasoning, data-oriented preparation, resilience-oriented professional development, and concrete pedagogical forms of implementation
Source: developed by the author based on W. Holmes *et al.* (2019), D. Long & B. Magerko (2020), D.T.K. Ng *et al.* (2021), L. Bounegru & G. Gray (2021), F. Miao & W. Holmes (2023), M.S. Hossain & D. Wenger (2024), C. Porlezza & A.K. Schapals (2024), S. Fiialka & Z. Kornieva (2024), V. Vladymyrov (2025)

The competency matrix also demonstrated direct pedagogical implications. The identified competency blocks should be formed through learning activities that combine professional practice, critical reflection, technological experimentation, and ethical decision-making. Traditional journalistic competencies require reporting assignments, editing workshops, and newsroom simulations. Digital and data-oriented competencies require multimedia projects, work with datasets, visualisation tasks, and audience analytics exercises. AI-related competencies should be developed through practical tasks that require students to test generative AI tools, compare human and AI-generated outputs, identify errors or bias, and explain editorial decisions. Ethical and accountability competencies should be taught through case studies, policy analysis, and editorial decision-making scenarios. Resilience-oriented competencies require verification labs, disinformation analysis, crisis reporting simulations, and OSINT-related exercises. Therefore, the pedagogical significance of the proposed matrix lies in connecting competency blocks with concrete learning activities and assessment evidence. This interpretation was consistent with recent studies that emphasise

the pedagogical conditions of AI integration in journalism education. D. Wenger *et al.* (2025) showed that the impact of AI on journalism education concerns not only professional skills but also curriculum design, faculty readiness, ethical preparation, and institutional decision-making. M. Jaakkola & J. Wiik (2025) demonstrated that journalism educators' preparedness to teach AI depends on the pedagogical domestication of AI tools rather than on technical awareness alone. L. Chen & M. Chen (2026) further indicated that generative AI can contribute to professional competency development when it is mediated by learning engagement and media literacy. These findings supported the view that AI should be integrated into journalism education through structured pedagogical tasks rather than isolated tool demonstrations.

Comparative regional patterns. The third result was the identification of three regional patterns of journalism education modernisation: the ethical-interdisciplinary European model, the policy-driven AI modernisation model in Türkiye, and the resilience-oriented Ukrainian model. Those patterns did not represent all possible regional trajectories, but they showed that digital and AI-related modernisation was shaped by educational traditions, policy priorities, institutional readiness, and socio-political conditions. The European pattern was characterised by interdisciplinary learning, responsible innovation, research-based education, critical media analysis, and ethical reflection. Institutional examples supported this tendency: the Erasmus Mundus Master's programme in Journalism, Media and Globalisation emphasised a critical, academic, and globally oriented understanding of journalism, while the University of Hamburg's programme in Communication and Journalism Research for a Sustainable Society connected journalism and digital media with digitalisation, artificial intelligence, public communication, and societal transformation.

The Turkish pattern reflected a policy-driven and curriculum-visible form of AI modernisation. H. Babacan *et al.* (2025) showed that AI-related content was increasingly present in Turkish journalism and new media programmes, but it often remained more theoretical than practice-oriented. A.F. Şen (2025) similarly indicated that direct AI integration in journalism curricula was still limited and that practical training with AI tools remained underdeveloped in the analysed public universities. The analysis of selected official Turkish curriculum materials showed that AI- and digital media-related courses were present in journalism-related programmes at Istanbul University, Çukurova University, and Selçuk University (Istanbul University, 2025; Çukurova University, 2025; Selçuk University, 2025). These materials confirmed the visibility of AI, digital journalism, data journalism, media ethics, digital news literacy, web design, and coding-related journalism practices in Turkish curricula, while also supporting the conclusion that AI integration often remains organised through separate courses or electives rather than through a fully integrated pedagogical model. The Ukrainian pattern differed because digital transformation intersects with wartime communication, information warfare, disinformation, crisis reporting, and the need for professional resilience. Ukrainian journalism education therefore combines digital media competencies with verification culture, fact-checking, OSINT-related practices, ethical responsibility, and preparation for high-risk information environments (Fiialka & Kornieva, 2024; Mykolaichuk, 2025; Vladymyrov, 2025). The Master's programme in Digital Media at Taras Shevchenko National University of Kyiv illustrated this tendency through learning outcomes related to digital media analysis, multimedia and interactive technologies, digital project management, data visualisation, automated processing of search results, and digital media projects. The comparative characteristics of the three regional patterns are presented in Table 3.

Table 3. Comparative regional patterns of journalism education modernisation

Region / context	Dominant modernisation logic	Key curriculum priorities	Competency emphasis	Main pedagogical challenge
Europe	Ethical and interdisciplinary modernisation	Digital journalism, media globalisation, communication research, data journalism, AI and digitalisation, responsible innovation	Critical media analysis, AI ethics, algorithmic accountability, research literacy, interdisciplinary thinking	Maintaining balance between technological innovation, professional values, and critical academic reflection
Türkiye	Policy-driven and curriculum-visible AI modernisation	AI and media, digital journalism, data journalism, digital news literacy, media ethics, web design, coding-related journalism practices	Conceptual AI awareness, digital journalism, data-oriented journalism, media literacy, technological adaptation	Moving from visible AI-related courses and electives toward systematic pedagogical integration of AI, data, ethics, and practice-based learning across journalism curricula
Ukraine	Resilience-oriented digital modernisation	Digital media, multimedia storytelling, data journalism, fact-checking, OSINT-related practices, crisis communication, AI-assisted learning	Verification culture, disinformation detection, digital resilience, ethical judgement, data-oriented journalism, crisis reporting	Integrating global digital competencies with preparation for information warfare and unstable media environments

Source: developed by the author based on M. Severijnen & Y. de Haan (2024), V. Katzenberger (2024), S. Fiialka & Z. Kornieva (2024), University of Amsterdam (2024), University of Hamburg (2024), Taras Shevchenko National University of Kyiv (2024), H. Babacan *et al.* (2025), A.F. Şen (2025), Istanbul University (2025), Çukurova University (2025), Selçuk University (2025), V. Vladymyrov (2025)

Table 3 showed that journalism education could not be modernised through a universal list of digital tools. Europe, Türkiye, and Ukraine all moved toward digitalisation and AI literacy, but they demonstrated different pedagogical priorities: ethical interdisciplinarity, policy-driven technological adaptation, and resilience-oriented preparation for unstable information environments. These differences are pedagogically significant because they determine not only what content should be included in journalism curricula but also how learning activities should be organised. In the European context, curriculum modernisation required ethically grounded interdisciplinary learning; in Türkiye, it required stronger movement from theoretical AI awareness to practical AI-supported learning tasks; in Ukraine, it required the integration of digital production, verification culture, crisis communication, and resilience-oriented professional preparation. The fourth result was the development of a conceptual pedagogical framework for journalism education transformation in the digital media era. The framework synthesised the previous findings and showed how changes in the media environment could be translated into curriculum design, competency formation, pedagogical strategies, and the expected graduate profile. It was based on the assumption that journalism education should not respond to digital transformation by mechanically adding technological courses, but should instead connect technological training with professional values, data-oriented thinking, AI literacy, ethical reasoning, and resilience-oriented preparation.

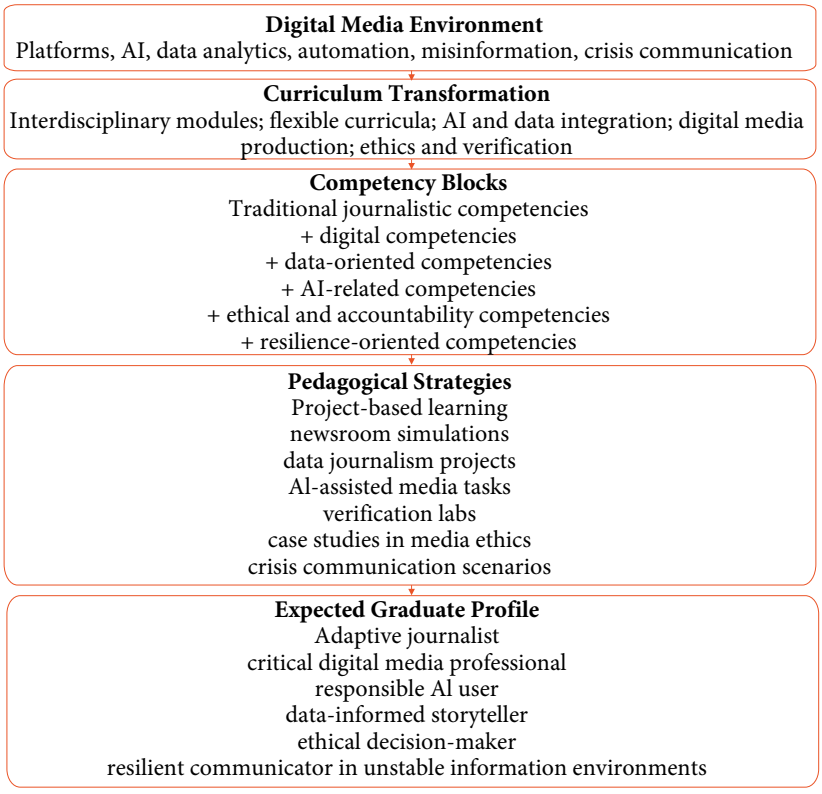

Figure 1. Conceptual pedagogical framework for journalism education transformation
Source: developed by the author

The framework connects the external transformation of digital media ecosystems with internal curriculum modernisation and the formation of an integrated graduate competency profile. The framework demonstrated a movement from tool-based modernisation to integrated pedagogical redesign. As a result, the expected graduate is not merely a user of digital tools but an adaptive, ethically responsible, data-informed, and resilient journalism professional.

DISCUSSION

The findings of this study indicated that the transformation of journalism education should be interpreted as a process of pedagogical redesign rather than as the simple introduction of digital tools into existing curricula. The analysis showed that digital media ecosystems, artificial intelligence, data-driven communication, platform infrastructures, and wartime information challenges affected not only the content of journalism training but also the logic of curriculum design, learning activities, assessment practices, and professional identity formation. Therefore, the main educational problem was not whether journalism programmes should include digital technologies or AI-related topics, but how these components should be pedagogically integrated with professional values, ethical

reasoning, verification culture, data-oriented thinking, and resilience-oriented preparation. This interpretation extends earlier discussions of journalism transformation by shifting the focus from media change as a professional phenomenon to media change as a curriculum and pedagogy problem. M. Deuze & T. Witschge (2018) and N. Diakopoulos (2020) remain useful for understanding broader changes in journalism, algorithmic media systems, and computational news practices. However, the present study used these foundational perspectives to support a specifically pedagogical argument: journalism education needs integrated learning models that connect technological awareness with editorial responsibility, critical reflection, and professional decision-making.

The first result, which identified the transition from industrial newsroom-centred education to multimedia journalism education and then to digital or AI-mediated journalism education, corresponded to previous studies on the historical and structural transformation of journalism training. L. Solkin (2020) argued that journalism education in the twenty-first century cannot be reduced to narrow vocational preparation because it increasingly involves broader questions of professional identity, knowledge production, and adaptation to media change. M. Severijnen & Y. de Haan (2024) similarly emphasised that journalism education must prepare students for a changing media landscape through more flexible and future-oriented models. O. Westlund *et al.* (2025) also pointed to the need to rethink journalism in the context of platformisation, algorithmic systems, and digital media ecosystems. The present study developed these arguments by showing that the current stage of journalism education was shaped not only by digitalisation but also by the growing influence of artificial intelligence, data analytics, algorithmic communication, and automated forms of content production.

The second result, the competency transformation matrix, showed that AI literacy in journalism education should not be reduced to operational familiarity with generative AI tools. Foundational studies on AI literacy remain useful for defining this competence as multidimensional and combining technical understanding, critical evaluation, ethical reasoning, and responsible application. In this sense, D. Long & B. Magerko (2020) and D.T.K. Ng *et al.* (2021) provided a conceptual basis for understanding AI literacy beyond instrumental tool use. However, more recent journalism-specific research has made this issue more pedagogically concrete. M.S. Wenger *et al.* (2025) showed that AI affected journalism education at the level of curriculum design, faculty readiness, ethical preparation, and institutional decision-making. T. Hollanek *et al.* (2025) further emphasised critical AI literacy as a condition of responsible reporting, transparency, and public accountability in AI-mediated media environments. These studies support the present article's argument that AI literacy should be integrated into journalism education through structured pedagogical tasks rather than through isolated demonstrations of AI tools. Students should not only generate texts, summaries, headlines, or story ideas with AI systems, but also compare AI-generated and human-produced outputs, identify factual errors, detect bias, explain editorial choices, formulate transparency statements, and justify whether AI use is appropriate in a given journalistic situation. This pedagogical interpretation is also consistent with L. Chen & M. Chen (2026), who indicated that generative AI integration contributed to professional competency development when it was mediated by learning engagement and media literacy. Therefore, AI literacy should be assessed not by students' ability to use a tool, but by their ability to use, question, verify, explain, and ethically contextualise AI-supported outputs.

Data-oriented competencies should be interpreted in the same integrated way. Data journalism requires analytical thinking, interpretation, visualisation, evidence-based storytelling, and the ability to transform complex information into socially meaningful narratives (Bounegru & Gray, 2021). The present study confirmed this position but added that data-oriented competencies should be developed together with AI literacy, verification culture, and ethical reasoning. From the perspective of competency-based education, journalism curricula should therefore focus not on the accumulation of separate digital courses but on the formation of coherent professional capability supported by reporting assignments, data projects, AI-output evaluation, verification laboratories, newsroom simulations, and reflective portfolios. The findings also correspond to broader research on artificial intelligence in higher education. W. Holmes *et al.* (2019) and O. Zawacki-Richter *et al.* (2019) remain important because they showed that AI in education becomes meaningful only when it is connected with curriculum, learning objectives, teacher-supported pedagogy, and assessment practices. The present study applied this broader educational argument to journalism education. It showed that AI-related modernisation should not be limited to the inclusion of separate AI modules; it should instead influence the design of reporting assignments, verification laboratories, data journalism projects, newsroom simulations, reflective portfolios, and ethical decision-making tasks.

The third result, which compared Europe, Türkiye, and Ukraine, demonstrated that journalism education modernisation was not a universal or linear process. Although all three contexts revealed movement toward digitalisation, AI literacy, and interdisciplinary learning, each represented a distinct pedagogical logic of modernisation. The European model can be interpreted as an ethical and interdisciplinary logic. European journalism education increasingly connects digital competencies with critical media analysis, research-based learning, algorithmic accountability, and responsible innovation (Katzenberger, 2024; Severijnen & de Haan, 2024; Porlezza & Schapals, 2024). This trajectory shows that modernisation should not be reduced to technical adaptation or labour-market response; it also involves the development of ethical and analytical skills required for democratic communication. The Turkish case represents

a policy-driven and curriculum-visible logic of AI modernisation. Recent studies demonstrated that artificial intelligence and digital transformation were increasingly present in journalism, communication, and new media programmes in Türkiye, although their integration often remained uneven and more theoretical than practice-oriented (Babacan *et al.*, 2025; Şen, 2025). The analysis of selected official curriculum materials from Istanbul University, Çukurova University, and Selçuk University supported this conclusion by showing that AI and digital media topics were visible in journalism-related curricula through courses or components related to AI and media, digital journalism, data journalism, digital news literacy, media ethics, web design, and coding-related journalism practices (Istanbul University, 2025; Çukurova University, 2025; Selçuk University, 2025). This finding is important because the formal inclusion of AI-related topics in curricula does not automatically guarantee deep pedagogical transformation. Effective AI integration requires practical tasks, interdisciplinary cooperation, assessment criteria, teacher readiness, and ethical frameworks for responsible use.

The Ukrainian model represents a resilience-oriented logic of modernisation. Its distinctiveness lies in the fact that digital transformation intersected with wartime communication, information warfare, disinformation, crisis reporting, and the need for professional responsibility in high-risk information environments (Fiialka & Kornieva, 2024; Vladymyrov, 2025). This distinguishes the Ukrainian case from models in which digitalisation is discussed mainly through innovation, technological modernisation, or employability. Ukrainian journalism education must prepare students to verify information under pressure, identify manipulative narratives, use open-source information responsibly, understand crisis communication, and maintain ethical standards in unstable media conditions. This finding is important for international scholarship because it conceptualises resilience not as an additional or external competence but as an integral component of contemporary journalism education. In stable media environments, resilience-oriented preparation may be discussed mainly in relation to misinformation, digital security, or platform risks. In Ukraine, however, it becomes a central pedagogical requirement. Therefore, the Ukrainian case demonstrates that digital journalism education should prepare students not only to produce content in technologically advanced media systems but also to act responsibly in unstable, high-risk, and conflict-affected information environments.

The fourth result, the conceptual pedagogical framework, should be understood as an authorial synthesis rather than as an empirically tested model. Its value lies in organising the identified transformations into a coherent educational sequence: digital media environment, curriculum transformation, competency blocks, pedagogical strategies, assessment evidence, and expected graduate profile. Compared with tool-based approaches to curriculum modernisation, the proposed framework emphasises that each technological component should be connected with a learning objective, a professional value, a pedagogical activity, and an assessment method. In practical terms, the framework can be used for curriculum renewal in several ways. First, it can help programme designers check whether digital and AI-related topics are integrated across professional, ethical, analytical, and reflective components of journalism training. Second, it can guide the design of learning activities such as AI-output evaluation, data storytelling projects, verification labs, newsroom simulations, crisis reporting scenarios, and reflective portfolios. Third, it can support assessment by linking competencies with observable evidence: verified journalistic texts, data visualisations, transparency notes, editorial justifications, fact-checking reports, and reflective analyses of AI-supported decision-making. Thus, the proposed framework contributes not only to theoretical systematisation but also to the pedagogical design of journalism education.

Several limitations should be considered. The study is conceptual and comparative rather than empirically validated through surveys, interviews, classroom observations, or quantitative curriculum mapping. It is also based on selected scholarly sources and institutional examples, which means that it does not provide a complete mapping of all journalism education programmes in the analysed regions. The findings therefore should be interpreted as a conceptual and comparative synthesis intended to clarify pedagogical tendencies rather than to provide a full empirical validation of the proposed framework. Future research should empirically test and refine the proposed framework through comparative curriculum analysis, interviews with journalism educators, surveys of students' AI literacy, and studies of assessment practices for digital, ethical, and resilience-oriented competencies. Additional research is also needed to examine how generative AI influences professional identity formation, editorial decision-making, verification practices, and ethical responsibility in journalism education.

CONCLUSIONS

The study specified the pedagogical and technological dimensions of journalism education transformation in the digital media era. The findings showed that this transformation should be understood not as the mechanical addition of digital tools or AI-related topics to existing curricula but as a process of pedagogical redesign that connects technological training with professional values, ethical reasoning, data-oriented thinking, verification culture, and resilience-oriented preparation. First, three major stages in the development of journalism education were identified: the industrial newsroom-centred model, the multimedia journalism model, and the contemporary digital or AI-mediated model. This distinction explained the transition from stable professional routines and print-oriented training toward flexible, interdisciplinary, and technologically mediated professional preparation. Second, the study substantiated the transition toward AI-mediated and data-oriented journalism education. Future journalists should be prepared not only to produce media content

but also to interpret data, understand algorithmic systems, evaluate AI-generated outputs, identify misinformation risks, and act responsibly in platform-based communication environments. Third, the key competency groups required for contemporary journalism education were established: traditional journalistic, digital, data-oriented, AI-related, ethical and accountability, resilience-oriented, and reflective pedagogical competencies. Their integration demonstrated that professional training should combine classical journalistic values with technological awareness, analytical capacity, ethical reasoning, and preparedness for unstable information environments. These competencies should be developed through structured learning activities, including newsroom simulations, data journalism projects, AI-output evaluation, verification labs, crisis reporting scenarios, and reflective portfolios. Fourth, the comparative analysis showed that Europe, Türkiye, and Ukraine represented different pedagogical logics of modernisation. European approaches primarily emphasised ethical and interdisciplinary modernisation; Türkiye demonstrated policy-driven and curriculum-visible AI modernisation; Ukraine revealed a resilience-oriented model shaped by information warfare, disinformation, crisis communication, verification culture, and OSINT-related practices. The proposed conceptual pedagogical framework may be used for curriculum renewal, course design, and alignment of learning outcomes with the real conditions of digital and AI-mediated journalistic practice. Its practical value lies in linking competency blocks with pedagogical strategies and assessment evidence. Further research should empirically test this framework through curriculum mapping, interviews with journalism educators, surveys of students' AI literacy, and analysis of assessment practices for digital, ethical, and resilience-oriented competencies.

ACKNOWLEDGEMENTS

None.

FUNDING

None.

CONFLICT OF INTEREST

None.

REFERENCES

[1] Babacan, H., Arık, E., Bilişli, Y., Akgün, H., & Özkara, Y. (2025). Artificial intelligence and journalism education in higher education: Digital transformation in undergraduate and graduate curricula in Türkiye. *Journalism and Media*, 6(2), article number 52. doi: 10.3390/journalmedia6020052.

[2] Bounegru, L., & Gray, J. (Eds.). (2021). *The data journalism handbook: Towards a critical data practice* (2nd ed.). Amsterdam: Amsterdam University Press. doi: 10.5117/9789462989511.

[3] Chen, L., & Chen, M. (2026). Technological integration and professional competency development: A structural equation analysis of generative AI, learning engagement, and media literacy in journalism education. *Frontiers in Education*, 11, article number 1812350. doi: 10.3389/feduc.2026.1812350.

[4] Cools, H., & Diakopoulos, N. (2024). Uses of generative AI in the newsroom: Mapping journalists' perceptions of perils and possibilities. *Journalism Practice*, 20(3), 878-896. doi: 10.1080/17512786.2024.2394558.

[5] Çukurova University. (2025). *Journalism programme course plan, 2025-2026 academic year*. Retrieved from https://iletisim.cu.edu.tr/gazetecilik/egitim/ders-plani/.

[6] Deuze, M., & Witschge, T. (2018). Beyond journalism: Theorizing the transformation of journalism. *Journalism*, 19(2), 165-181. doi: 10.1177/1464884916688550.

[7] Diakopoulos, N. (2020). Computational news discovery: Towards design considerations for editorial orientation algorithms in journalism. *Digital Journalism*, 8(7), 945-967. doi: 10.1080/21670811.2020.1736946.

[8] Fiialka, S., & Kornieva, Z. (2024). Journalism education in times of War: New challenges and adaptation strategies. *Advanced Education*, 12(25), 25-43. doi: 10.20535/2410-8286.316512.

[9] Hollanek, T., Peters, D., Drage, E., & Hernandes, R. (2025). AI, journalism, and critical AI literacy: Exploring journalists' perspectives on AI and responsible reporting. *AI & Society*, 40, 6393-6405. doi: 10.1007/s00146-025-02407-6.

[10] Holmes, W., Bialik, M., & Fadel, C. (2019). *Artificial intelligence in education: Promises and implications for teaching and learning*. Boston: Center for Curriculum Redesign.

[11] Hossain, M.S., & Wenger, D. (2024). Has journalism education kept up with digital transformation? *Journalism & Mass Communication Educator*, 79(2), 129-146. doi: 10.1177/10776958231224038.

[12] Istanbul University. (2025). *Journalism undergraduate programme curriculum*. Retrieved from https://surli.cc/hhhrbt.

[13] Jaakkola, M., & Wiik, J. (2025). No-panic pragmatism: Nordic journalism educators' preparedness to teach artificial intelligence (AI) in 2024. *Journalistica*, 19(1), 198-224. doi: 10.7146/journalistica.v19i1.151947.

[14] Katzenberger, V. (2024). Mind the gap: Re-thinking digital skills in journalism education in Germany. *Media Practice and Education*. doi: 10.1080/25741136.2024.2435805.

[15] Long, D., & Magerko, B. (2020). What is AI literacy? Competencies and design considerations. In *Proceedings of the 2020 CHI conference on human factors in computing systems* (pp. 1-16). New York: Association for Computing Machinery. doi: 10.1145/3313831.3376727.

[16] Miao, F., & Holmes, W. (2023). *Guidance for generative AI in education and research*. Paris: UNESCO. doi: 10.54675/EWZM9535.
[17] Mykolaichuk, A. (2025). Integration of artificial intelligence tools into English language instruction for journalism students. *Scientific Papers of Berdiansk State Pedagogical University. Series Pedagogical Sciences*, 2, 188-198. doi: 10.32782/2412-9208-2025-2-188-198.
[18] Ng, D.T.K., Leung, J.K.L., Chu, S.K.W., & Qiao, M.S. (2021). Conceptualizing AI literacy: An exploratory review. *Computers and Education: Artificial Intelligence*, 2, article number 100041. doi: 10.1016/j.caeai.2021.100041.
[19] Pavlik, J.V. (2023). Collaborating with ChatGPT: Considering the implications of generative artificial intelligence for journalism and media education. *Journalism & Mass Communication Educator*, 78(1), 84-93. doi: 10.1177/10776958221149577.
[20] Porlezza, C., & Schapals, A.K. (2024). AI ethics in journalism (studies): An evolving field between research and practice. *Emerging Media*, 2(3), 356-370. doi: 10.1177/27523543241288818.
[21] Sánchez-García, P., Diez-Gracia, A., Mayorga, I.R., & Jerónimo, P. (2025). Media self-regulation in the use of AI: limitation of multimodal generative content and ethical commitments to transparency and verification. *Journalism and Media*, 6(1), article number 29. doi: 10.3390/journalmedia6010029.
[22] Selçuk University. (2025). *Journalism undergraduate programme curriculum*. Retrieved from https://bologna.selcuk.edu.tr/tr/dersler/iletisim-gazetecilik-gazetecilik-lisans.
[23] Şen, A.F. (2025). Journalism education in the age of AI: Curriculum analysis from Turkey. *Advances in Applied Sociology*, 15(04), 311-330. doi: 10.4236/aasoci.2025.154017.
[24] Severijnen, M., & de Haan, Y. (2024). Educating for a changing media landscape: Four scenarios for journalism education in 2030. *Journalism Studies*, 25(16), 1931-1948. doi: 10.1080/1461670X.2024.2406814.
[25] Solkin, L. (2020). Journalism education in the 21st century: A thematic analysis of the research literature. *Journalism*, 23(2), 444-460. doi: 10.1177/1464884920977299.
[26] Taras Shevchenko National University of Kyiv. (2024). *Educational and Scientific Institute of Journalism: Specialities and educational programmes*. Retrieved from https://knu.ua/en/departments/journalism/.
[27] University of Amsterdam. (2024). *Journalism, media and globalisation (Erasmus Mundus master's)*. Retrieved from https://www.uva.nl/shared-content/programmas/en/joint-programme/journalism-media-and-globalisation/journalism-media-and-globalisation.html.
[28] University of Hamburg. (2024). *Master of arts communication and journalism research for a sustainable society (ComSustain)*. Retrieved from https://www.wiso.uni-hamburg.de/studienbuero-sozialwissenschaften/studiengaenge/ma-comsustain.html.
[29] Vladymyrov, V. (2025). Innovations in media teaching with artificial intelligence. *Scientific Notes of the Institute of Journalism*, 86, 115-124. doi: 10.17721/2522-1272.2025.86.10.
[30] Wenger, D., Hossain, M.S., & Senseman, J.R. (2025). AI and the impact on journalism education. *Journalism & Mass Communication Educator*, 80(1), 97-114. doi: 10.1177/10776958241296497.
[31] Westlund, O., Boyles, J.L., Guo, L., Saldaña, M., Salaverría, R., Thomson, T.J., & Wu, S. (2025). Digital journalism (studies): An agenda for the future. *Digital Journalism*, 13(2), 179-194. doi: 10.1080/21670811.2025.2474530.
[32] Zawacki-Richter, O., Marín, V.I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education: Where are the educators? *International Journal of Educational Technology in Higher Education*, 16, article number 39. doi: 10.1186/s41239-019-0171-0.

Аліса Миколайчук
Кандидат філологічних наук, доцент
Київський національний університет імені Тараса Шевченка
01033, вул. Володимирська, 60, м. Київ, Україна
https://orcid.org/0000-0003-2073-1954

Педагогічний і технологічний виміри цифрової трансформації журналістської освіти

Анотація. Сучасна журналістська освіта зазнає трансформації під впливом цифрових медіаекосистем, платформної комунікації, дата-орієнтованого виробництва новин і штучного інтелекту, однак інтеграція цифрових умінь, етичного мислення, професійних цінностей і компетентностей стійкості в освітніх програмах залишається недостатньо систематизованою. Мета дослідження полягала в аналізі педагогічних і технологічних вимірів трансформації журналістської освіти в епоху цифрових медіа та обґрунтуванні інтегрованої компетентнісно орієнтованої рамки професійної підготовки. У дослідженні використано історико-педагогічний аналіз, порівняльний аналіз і системний підхід. Емпіричну основу становили сучасні рецензовані наукові публікації та окремі матеріали освітніх програм, що репрезентують різні регіональні контексти. Визначено три етапи розвитку журналістської освіти: індустріальну ньюзрум-орієнтовану освіту, мультимедійну журналістську освіту та цифрову журналістську освіту, сформовану під впливом штучного інтелекту, аналітики даних і алгоритмічної комунікації. Результати засвідчили, що сучасні освітні програми з журналістики дедалі частіше поєднують класичні професійні цінності з цифровим сторітелінгом, журналістикою даних, аналітикою аудиторії, грамотністю у сфері штучного інтелекту, культурою верифікації та етичним ухваленням рішень. Порівняльний аналіз показав, що європейські моделі переважно акцентують відповідальні інновації та міждисциплінарне навчання, турецькі програми відображають політично зумовлену технологічну модернізацію, тоді як українська журналістська освіта поєднує цифрові компетентності з підготовкою до стійкості в умовах інформаційної війни та кризової комунікації в умовах повномасштабного вторгнення та війни росії проти України. Практична цінність дослідження полягала в уточненні компетентнісних блоків і педагогічних пріоритетів, які можуть бути використані для оновлення освітніх програм, проєктування навчальних курсів і розвитку подальших емпіричних досліджень інтеграції штучного інтелекту в журналістську освіту

Ключові слова: модернізація освітніх програм; цифрова педагогіка; грамотність у сфері штучного інтелекту; вища освіта; професійні компетентності; кризова комунікація

UDC 159.944.4:378
DOI: 10.52534/msu-pp2.2026.47

ISSN 2413-3329
E-ISSN 2520-6788

Liudmyla Romanovska
Doctor of Pedagogy, Professor
Khmelnytskyi National University
29016, 11 Instytutska Str., Khmelnytskyi, Ukraine
https://orcid.org/0000-0001-7547-4575

Oksana Kravchuk*
PhD in Economics, Associate Professor
Kyiv National Economic University named after Vadym Hetman
03057, 54/1 Beresteiskyi Ave., Kyiv, Ukraine
https://orcid.org/0000-0002-6337-7759

Iryna Varis
PhD in Economics, Associate Professor
Kyiv National Economic University named after Vadym Hetman
03057, 54/1 Beresteiskyi Ave., Kyiv, Ukraine
https://orcid.org/0000-0002-9502-5045

Digital overload and burnout in higher education

Article's History:
Received: 15.12.2025
Revised: 20.04.2026
Accepted: 25.05.2026
Published: 29.06.2026

Suggested Citation:
Romanovska, L., Kravchuk, O., & Varis, I. (2026). Digital overload and burnout in higher education. *Scientific Bulletin of Mukachevo State University. Series "Pedagogy and Psychology"*, 12(2), 47-64. doi: 10.52534/msu-pp2.2026.47.

*Corresponding author
(oksana.kravchuk@kneu.edu.ua)

Abstract. The study's relevance stems from the expansion of the digital educational environment, in which students and teachers face not only intensive use of technology but also information overload, constant availability, fragmented communication, cognitive strain, and limited opportunities for recovery. The article's purpose was to systematise the manifestations of digital overload and digital burnout in higher education, identify their stages, clarify role-specific differences between students and teachers, and determine the institutional conditions that intensify or mitigate the risk of burnout. The methodological basis of the study comprised a narrative review, conceptual analysis, comparative analysis, typological generalisation, and model building, drawing on recent research on technostress, academic and occupational burnout, online learning fatigue, videoconferencing exhaustion, digital resilience, and psychological well-being in educational organisations. The findings showed that digital burnout has a multidimensional structure encompassing emotional, cognitive, behavioural, social and physiological manifestations. A developmental continuum was substantiated, ranging from episodic digital stress to digital fatigue, digital overload and clinically significant burnout. An authorial typology of role-specific manifestations of digital burnout was developed: among students, it is associated with academic exhaustion, procrastination, declining motivation, weakened learning identity and reduced sense of belonging; among teachers, it is associated with emotional exhaustion, digital pedagogical insecurity, depersonalisation of online interaction, hidden digital labour and reduced teaching quality. The article proposed a conceptual model of digital burnout in higher education, organised by stages, role-specific manifestations, and institutional outcomes. The practical value of the study lies in substantiating differentiated prevention measures for students, teachers, and higher education administrators, with consideration of digital boundaries, workload governance, support systems, early diagnosis, and crisis-related contextual conditions

Keywords: digital burnout; technostress; academic exhaustion; teacher well-being; online learning fatigue; wartime education

Copyright © The Author(s). This is an open access article distributed under the terms of the Creative Commons Attribution License 4.0 (https://creativecommons.org/licenses/by/4.0/)

INTRODUCTION

Digital transformation has become a structural condition of contemporary higher education rather than an additional technological layer. Learning management systems, videoconferencing platforms, digital assessment tools, electronic communication channels, automated scheduling, and artificial intelligence-based applications increasingly mediate everyday interaction among students, teachers, and higher education institutions, expanding access to education, enhancing the flexibility of learning, and ensuring the continuity of the educational process, particularly during crisis periods. At the same time, these processes have intensified the psychological burden on participants of the educational process by multiplying the number of channels, tasks, notifications, interfaces and expectations that an individual is forced to process simultaneously. The accumulated burden increasingly manifests not as temporary fatigue but as a persistent digital burnout syndrome that requires systematic scientific understanding. The issue of digital overload and burnout has received substantial empirical support in several recent studies.

A. Aria *et al.* (2024) applied grey Delphi and grey-DEMATEL methods to identify the factors influencing students' academic burnout in online learning during the COVID-19 pandemic. The authors established a causal hierarchy of factors. They showed that technological barriers and a lack of institutional support serve as primary triggers, initiating a cascade of secondary factors – emotional exhaustion and decreased motivation. In contrast, the online learning format itself has a secondary effect relative to the quality of organisational support. L.Z. Chong *et al.* (2025) conducted a review of the factors contributing to burnout across different student populations. The researchers systematised the factors by level (individual, academic, social). They concluded that students' academic burnout is a multifactorial phenomenon in which the burden of digital tools overlaps with classical academic stressors, intensifying the cumulative effect of exhaustion rather than acting as a separate, independent factor. P.D. Deep & Y. Chen (2025) examined the relationships among student burnout, mental health, and online learning fatigue during the COVID-19 period, separately considering the roles of institutional support and artificial intelligence. The authors concluded that insufficient institutional support is a stronger predictor of burnout than the intensity of digital technology use itself, and that AI-based tools may either alleviate or intensify the burden depending on how they are integrated into the learning process. H. Li & J. Yang (2025) analysed the role of loneliness in the development of burnout during online learning in the COVID-19 period. The study demonstrated that loneliness functions not as a side effect but as a structural mediator between students' digital isolation and emotional exhaustion, meaning that social deprivation within the digital environment constitutes an independent pathogenic mechanism of digital burnout, distinct from purely workload-related factors.

J.N. Bailenson (2021) theoretically explained the causes of videoconferencing fatigue (Zoom fatigue), linking it to nonverbal overload, mirror anxiety from constantly viewing one's own image, reduced mobility and increased cognitive load during synchronous video communication. The author's four-cause model became the conceptual basis for subsequent empirical scales measuring digital fatigue. G. Fauville *et al.* (2021) operationalised Zoom exhaustion as a multidimensional construct encompassing general, visual, social, motivational and emotional fatigue, developing a corresponding measurement scale. The researchers demonstrated that different dimensions of fatigue exhibit distinct escalation dynamics and respond differently to the duration and frequency of video interaction, enabling early diagnosis of digital burnout through individual subscales rather than solely an aggregate score. B.-C. Chen *et al.* (2024) investigated the effects of teachers' perceived competence in using information and communication technologies and of workplace anxiety on their well-being, with emotional exhaustion mediating the relationship. The authors found that low perceived digital competence reduces teachers' subjective well-being indirectly, through emotional exhaustion, rather than directly, which indicates that competence is a key resource for counteracting digital burnout within the job demands-resources framework. N.S. Bobro (2024) examined the features of digital transformation in Ukrainian higher education and showed that digitalisation changes not only the technological infrastructure of educational institutions but also the very organisation of the educational process and the nature of interaction among its participants, generating new requirements for teachers' professional activity.

O. Soroka (2025) analysed the transformation of higher education teachers' professional activity under conditions of digitalisation and concluded that the expansion of teachers' digital responsibilities (content design, online communication, digital assessment) occurs without a proportional revision of normative workload, which creates a hidden, statistically invisible reserve of professional overload. O.A. Prokopenko (2025) documented manifestations of emotional exhaustion and fatigue among students under wartime conditions, showing that wartime stressors (anxiety about safety, interruption of the learning process, forced displacement) overlap with the digital burden of distance learning, intensifying burnout symptoms beyond the additive level observed under peacetime conditions. UNESCO and the International Task Force on Teachers for Education 2030 (2024), in a global report, established that the sustainability of education systems depends directly on institutions' capacity to support teachers' professional well-being and reduce excessive stress-related workload, which positions institutional support as a structural rather than auxiliary factor in burnout prevention. The synthesis of the studies reviewed above demonstrated that digital overload and burnout within the higher education system constitute a multidimensional phenomenon that manifests differently

for students and teachers, is mediated by institutional support and digital competence, and, in the Ukrainian context, is further complicated by the overlap of wartime stressors with the digital demands of the educational process. These findings substantiated the need to systematise the manifestations of digital overload and burnout and to clarify their staged progression and early diagnostic markers.

The purpose of the article was to systematise the manifestations of digital overload and digital burnout in higher education, to clarify their stage-based dynamics, early diagnostic markers and specific patterns of manifestation among students and teachers. The research tasks included distinguishing digital stress, digital fatigue, digital overload and digital burnout as related but distinct phenomena; identifying emotional, cognitive, behavioural, social and physiological symptoms; comparing the specific manifestations among students and teachers; and substantiating preventive implications for higher education institutions. The scientific novelty lay in conceptualising digital burnout as a multidimensional, stage-based syndrome that develops through the interaction of individual resources, digital demands, educational roles and institutional support.

MATERIALS AND METHODS

The article was structured as a narrative conceptual review. The material was selected from recent peer-reviewed publications and authoritative institutional reports on technostress, burnout, online learning fatigue, teacher well-being, digital transformation of education and student mental health. Preference was given to studies published within the last five years. The synthesis proceeded in four stages: conceptual delimitation of key terms; grouping of symptoms by functional domains; comparison of student and teacher manifestations; and formulation of prevention-oriented implications. This methodological approach enabled the integration of empirical findings without creating a new statistical sample and was consistent with the study's review-based design. The study was designed as a theoretical and review-based analysis to develop a conceptual understanding of digital burnout in higher education. The research material comprised scholarly publications on digital burnout, technostress, Zoom fatigue, online learning fatigue, academic burnout, teacher burnout, digital overload, and digital well-being in higher education. In addition, institutional reports and analytical documents on teachers' work-related stress and the transformation of education under digitalisation were used, directly supporting the interpretation of institutional risks and the development of prevention strategies.

The selection of sources was based on four criteria. First, the publication had to address digital strain, burnout, technostress, online learning, videoconferencing fatigue, or related psychological and organisational consequences of digitalisation. Second, priority was given to studies published in the past five years, with earlier foundational works retained only if they provided conceptual or methodological grounding for the analysis of burnout, technostress, or academic burnout. Third, sources were included only if their content was directly used in the article's argument. Fourth, Ukrainian studies were included when they helped explain the wartime context of digital education, student resilience, emotional exhaustion, psychological insecurity, and disrupted learning routines.

The research was conducted in several stages. At the first stage, the conceptual field was defined by distinguishing episodic digital stress, digital fatigue, digital overload, and digital burnout. The boundaries between these four states were delineated on theoretical and symptomatic grounds rather than through empirically derived thresholds: each subsequent state was distinguished from the previous one by the conceptual definitions established in the foundational burnout and technostress literature, and the qualitative shift in the dominant symptom domain reported across the reviewed empirical studies – from isolated, reversible reactions characteristic of episodic digital stress, to cumulative and recurrent symptoms characteristic of digital fatigue, to cross-domain accumulation (cognitive, emotional, behavioural) characteristic of digital overload, to the stable, multidimensional and functionally impairing symptom pattern characteristic of digital burnout. No numerical cut-off scores were applied, since the underlying sources themselves are heterogeneous in measurement; the distinction is therefore analytical-conceptual rather than psychometric. This stage helped avoid reducing digital burnout to general screen fatigue or ordinary tiredness. At the second stage, the selected literature was analysed across the main domains of manifestation: emotional, cognitive, behavioural, social, and physiological. At the third stage, the manifestations of digital burnout among students and teachers were compared to identify role-specific differences in academic participation, self-regulated learning, professional identity, digital pedagogical confidence, hidden digital labour, and institutional expectations. At the fourth stage, the identified manifestations were systematised into stage- and role-sensitive typologies. At the final stage, the results of the analytical synthesis were generalised into a conceptual model of digital burnout in higher education, structured by stages, role-specific manifestations, and institutional outcomes.

The methodological basis of the study comprised conceptual analysis, comparative analysis, narrative literature review, typological generalisation, and model building. Conceptual analysis was used to clarify the relationships among digital stress, fatigue, overload, and burnout. A comparative analysis was conducted to identify differences between student- and teacher-specific manifestations of digital burnout. A narrative literature review was used to synthesise empirical and theoretical findings across diverse research contexts. Typological generalisation enabled the grouping of symptoms, risk amplifiers, protective factors, and prevention priorities into coherent analytical categories. Model building was used to present the interactions among digital demands, resources, role-specific manifestations, institutional factors, and possible outcomes. The

institutional priorities and practical recommendations presented in the Results section were not derived deductively from a single theoretical premise or statistically inferred from primary data, as no primary data were collected. Instead, they were obtained through a two-step procedure of typological generalisation combined with interpretive synthesis of institutional sources: first, recurring protective and risk factors reported across the reviewed empirical studies were grouped into typological categories (e.g., technical support, communication norms, workload design, psychological assistance); second, these categories were cross-checked against the recommendations and structural conditions identified in institutional reports (UNESCO, OECD) to ensure that the resulting priorities were grounded in documented institutional practice rather than in the authors' inference alone. Where a recommendation could not be traced to either a recurring empirical pattern or an institutional source, it was excluded from the Results. The study did not involve primary empirical data collection, including surveys, experiments or interviews. Therefore, no experimental sample was formed, and no direct interaction with respondents took place. The analytical units of the study were scholarly concepts, empirical findings from previous studies, symptom descriptions, institutional factors and prevention mechanisms identified in the reviewed literature. The study's reproducibility was ensured by the explicit description of the source selection criteria, the analytical stages and the categories used for systematisation. Other researchers could replicate the analytical procedure by applying the same criteria to the literature on digital burnout, technostress, online learning fatigue and teacher burnout in higher education.

RESULTS AND DISCUSSION

Conceptual boundaries of digital overload and digital burnout

A clear distinction between digital stress, digital fatigue, digital overload, and digital burnout is necessary because these concepts represent different levels of severity and require distinct interventions. Digital stress is a situational response to a specific technological challenge, such as a platform failure, an unfamiliar interface, an unexpected online assessment, or a sudden increase in digital communication. It is typically short-term, reversible, and linked to an identifiable trigger. Digital fatigue is a prolonged state of physical, cognitive, and emotional tiredness caused by intensive technology use; it is reversible through rest, ergonomic adjustments, and reduced digital exposure. Digital overload arises when digital demands systematically exceed an individual's adaptive resources and standard recovery no longer restores functioning. Digital burnout is the most severe stage, in which chronic digital overload is associated with emotional exhaustion, detachment, cynicism, reduced effectiveness, and persistent psychosomatic consequences.

This differentiation aligns with the logic of burnout theory. C. Maslach & M.P. Leiter (2016) conceptualised burnout as a psychological syndrome involving exhaustion, cynicism or detachment, and reduced efficacy, while the World Health Organisation (2019) defines burnout as an occupational phenomenon resulting from chronic workplace stress that has not been successfully managed. In higher education, however, the boundaries between work, study, and personal life are increasingly mediated by digital platforms. Students may experience study-related burnout, while teachers experience occupational burnout; nevertheless, both groups are embedded in the same digital educational ecosystem. The classical burnout model, therefore, requires extension to account for the technological architecture of interaction, including constant connectivity, platform switching, notification pressure, online visibility, and the absence of clear boundaries for recovery.

Research on technostress helped identify the digital sources of this syndrome. M. Salanova *et al.* (2013) described technostrain and technoaddiction as two important psychological experiences associated with the use of information and communication technologies. Technostrain includes anxiety, fatigue, scepticism and inefficacy beliefs related to technology use, whereas technoaddiction refers to excessive and compulsive technology use. M. Tarafdar *et al.* (2019) later distinguished between techno-distress and techno-eustress, demonstrating that technology use is not inherently harmful, as its effects depend on the balance between digital demands, individual control, available resources, perceived meaning and design conditions. This distinction is particularly relevant to higher education, where digital tools can support autonomy, participation, and inclusion when well designed and accompanied by adequate training. However, when technologies are introduced rapidly, fragmented across platforms, and used without pedagogical moderation, they become a source of chronic overload rather than educational empowerment. It was emphasised in the present analysis that the author's "design conditions" are not external to the demands-resources balance but constitute one of its inputs: the interface itself is a fixed structural demand, while institutional, pedagogical and managerial choices determine whether that fixed demand is compensated by adequate resources (training, scheduling, optional camera use, session length) or left unmitigated. Digital burnout, therefore, does not originate from either ergonomics or management in isolation, but from the interaction between a platform's built-in design constraints and the institutional capacity to buffer them.

Digital burnout should also be distinguished from general screen fatigue. Screen fatigue primarily refers to tiredness from prolonged screen exposure. Digital burnout has a broader psychosocial profile: it includes emotional exhaustion after digital interactions, cognitive fragmentation from constant task-switching, behavioural avoidance of digital tasks, social distancing from online communication, and physiological symptoms such as headaches, eye strain, sleep disruption, and musculoskeletal pain. R. Riedl (2012) demonstrated that technostress is associated with biological stress responses, including changes in cardiovascular activity and stress hormone levels,

indicating that digital overload has bodily consequences and cannot be reduced to a purely subjective complaint. N. Dragano & T. Lunau (2020) also discussed the relationship between technostress at work and mental health risks, confirming that chronic and poorly regulated digital demands may acquire clinical significance. The measurement of digital burnout remains an emerging field. S.-Y. Choi & J.-H. Kim (2024) validated the Korean version of the Digital Burnout Scale among university students, showing that digital burnout is becoming increasingly operationalised and measurable in higher education contexts. At the same time, digital burnout in higher education requires instruments sensitive to role-specific manifestations. A student may show signs of burnout by avoiding synchronous classes, postponing online assignments, or losing their academic identity. A teacher may show burnout by minimising feedback, delaying online responses, relying on repetitive templates, or emotionally distancing themselves from students. Therefore, digital burnout should be conceptualised not only as a psychological state but also as a pattern of educational participation that affects the quality of learning and institutional relations.

The job demands-resources perspective offered a useful analytical framework for interpreting this process. According to A.B. Bakker & E. Demerouti (2017), job demands increase the risk of exhaustion, whereas resources can buffer the negative impact of demands and support engagement. In digital higher education, digital demands include the volume of information, the number of platforms, the frequency of synchronous sessions, the complexity of digital tools, constant availability, and the uncertainty of technological change. Digital resources include training, platform usability, institutional support, autonomy, peer support, recovery time, and digital competence. When digital demands are high and resources are insufficient, the risk of burnout increases. Conversely, when digital tools are meaningful, predictable, and well supported, they can become resources for learning and teaching. This explained why the same technology can be experienced as enabling by one user and exhausting by another.

Multidimensional symptoms and stage progression in digital burnout

Digital burnout manifests across five interrelated domains: emotional, cognitive, behavioural, social and physiological. Emotional manifestations typically appear first, including irritability, frustration, and anxiety before online interactions; emotional depletion after videoconferences; and a loss of enthusiasm for digital tasks. B.-C. Chen *et al.* (2024) found that teachers' perceived competence in using information and communication technologies was associated with lower emotional exhaustion and higher well-being, while workplace anxiety affected well-being indirectly through emotional exhaustion. This finding suggested that digital demands influence well-being not only directly but also through the gradual depletion of emotional resources. Among students, emotional depletion may be accompanied by discouragement about learning and by the perception that online participation has become mechanical rather than meaningful.

Cognitive manifestations are central because digital education requires sustained attention, rapid information processing, memory updating and continuous task switching. J.N. Bailenson (2021) theoretically explained that videoconferencing may intensify cognitive effort because participants need to process enlarged facial cues, monitor their own image, compensate for reduced mobility and interpret limited nonverbal signals. Within the demands-resources logic applied in the present analysis, Beilenson's interface-level mechanisms (mirror anxiety, enlarged facial cues, restricted mobility) were read as a particular, fixed category of digital demand rather than as a self-contained explanation competing with M. Tarafdar *et al.* (2019) framework; the platform's design sets the baseline cognitive load, while institutional and pedagogical decisions on top of that baseline (camera-optional policies, session length, scheduled breaks) determine whether this load accumulates into fatigue, overload or burnout. J.M. Basch *et al.* (2025) demonstrated that evidence-based interventions can reduce Zoom fatigue in university online education, suggesting that this form of fatigue is linked to modifiable conditions of digital interaction. Typical cognitive symptoms include reduced concentration, slowed information processing, impaired working memory, difficulty making decisions and the subjective experience of mental fog.

Behavioural symptoms can be interpreted as attempts to reduce overload, although they may become maladaptive over time. Students may postpone watching recorded lectures, avoid using online platforms, delay submitting assignments, keep their cameras off, or attend synchronous classes while multitasking. Teachers may delay feedback, reduce consultation time, simplify course design or avoid complex digital tools. F. Saleem *et al.* (2024) found that technostress among students reduces the quality of online learning, while instructor and university support can buffer its negative effects. Similarly, C.B. Califf & S. Brooks (2020), in a study of K-12 teachers, demonstrated that techno-stressors may contribute to burnout and turnover intentions when literacy facilitation is insufficient.

Social manifestations are paradoxical because digital technologies increase the technical capacity for communication without necessarily improving the quality of social presence. Students may feel lonely despite constant online contact, and teachers may feel emotionally distant from students who appear as icons, avatars or silent participants. H. Li & J. Yang (2025) showed that loneliness is an important factor in online learning burnout. A.-M. Cazan *et al.* (2024) demonstrated that technostress creators and inhibitors vary across cultural contexts and differ between teachers and students. This finding supported the interpretation that social fatigue may arise not from a lack of communication but from an excess of fragmented, emotionally thin digital interactions.

Physiological manifestations include headaches, eye strain, musculoskeletal pain, sleep disturbance and psychosomatic symptoms. W. Emmamally *et al.* (2024) described Zoom exhaustion and fatigue among nursing students, showing that prolonged participation in online educational formats is associated with physical, cognitive and emotional exhaustion. Sleep disturbance is particularly important because it can link digital overload to cognitive decline and emotional instability. When students or teachers work late, check messages at night or remain psychologically connected to platforms after the formal end of the day, recovery is incomplete. The International Labour Organisation (2017) noted that information and communication technology-enabled work can be performed at any time and from almost anywhere, which blurs boundaries between work and private life. By analogy, in higher education, this boundary problem affects both teaching and studying.

These symptoms develop along a continuum rather than as isolated complaints. The first stage is episodic digital stress, which remains situational and reversible. The second stage is digital fatigue, in which tiredness persists after intensive digital sessions but improves with rest and behavioural adjustment. The third stage is digital overload, in which digital demands consistently exceed available resources, leading to chronic symptoms. The fourth stage is digital burnout, characterised by stable emotional exhaustion, detachment and reduced effectiveness that impair educational functioning. C. Leclercq & I. Hansez (2024) emphasised that prevention should consider the temporal stages of burnout, as interventions effective at early stages may be insufficient once chronic exhaustion has developed.

The reviewed literature showed that digital overload and digital burnout develop gradually and involve emotional, cognitive, behavioural, social and physiological manifestations. For analytical purposes, these manifestations were organised into a continuum of stages, progressing from episodic digital stress to digital fatigue, overload, and burnout. Table 1 summarises the dominant symptoms at each stage and the corresponding institutional responses that may prevent further progression.

Table 1. Stage continuum of digital overload and digital burnout in higher education

Stage	Dominant manifestations	Recommended institutional response
Episodic digital stress	Situational irritation caused by technical problems; mild anxiety before using a new platform; short-term decline in concentration; temporary eye strain or muscle tension; symptoms disappear after the stressor is removed	Prompt technical support; clear and concise digital instructions; short breaks during digital activities; introductory training in basic digital skills; reduced uncertainty when new platforms are introduced
Digital fatigue	Tiredness after prolonged online sessions; reduced attention and slower information processing; headaches, eye strain, neck or back discomfort; lower motivation for digital interaction; need for rest and recovery	Structured breaks between online activities; limits on the duration of synchronous sessions; ergonomic guidance; realistic planning of digital workload; encouragement of recovery practices and sleep hygiene
Digital overload	Persistent exhaustion that does not disappear after ordinary rest; mental fog and information overload; procrastination of digital tasks; sleep disruption; avoidance of online communication; weakened social connections and growing emotional distancing	Digital boundary policies; reduction of platform fragmentation and duplicated communication channels; review of hidden digital workload; access to psychological counselling; peer support mechanisms; flexible deadlines where justified
Digital burnout	Chronic emotional exhaustion; depersonalisation or cynicism toward digital interaction; reduced academic or professional effectiveness; psychosomatic complaints; absenteeism or presenteeism; loss of motivation and sense of efficacy	Professional psychological support; temporary reduction or redistribution of digital workload; organisational redesign of digital processes; long-term recovery planning; monitoring of relapse risk; institutional recognition of digital labour

Note: the stages should be understood as a continuum rather than a strictly linear sequence; depending on individual and institutional resources, progression may slow down, stop, or reverse at any stage
Source: developed by the authors based on C. Maslach & M.P. Leiter (2016), J.N. Bailenson (2021), G. Fauville *et al.* (2021), W. Emmamally *et al.* (2024), C. Leclercq & I. Hansez (2024), J.M. Basch *et al.* (2025)

Table 1 showed that early stages of digital distress can often be managed through relatively simple organisational measures, such as technical support, structured breaks and clearer digital instructions. However, when fatigue develops into overload or burnout, individual self-regulation becomes insufficient. At these stages, higher education institutions need to address the structure of digital workload, communication norms, platform fragmentation and access to psychological support. Thus, digital burnout was interpreted not only as an individual psychological reaction but also as an institutional risk that requires systematic prevention. This progression is visualised in Figure 1.

Figure 1 demonstrated that the progression of digital burnout is not linear or predetermined. With sufficient protective resources, such as digital self-regulation, social support, ergonomic organisation of digital work and institutional support, progression may be slowed, stopped or reversed. The most important transition points were the movement from episodic stress to digital fatigue, from fatigue to chronic overload and from overload to burnout. Each stage was associated with specific marker symptoms, making early identification and stage-specific interventions essential to prevent severe academic, professional, and health-related consequences.

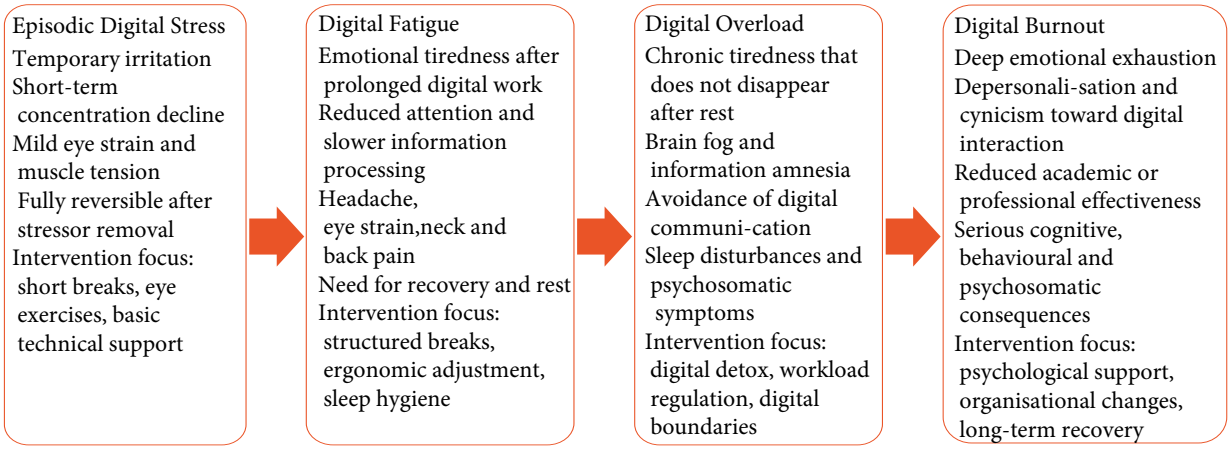

Figure 1. Continuum of digital burnout progression: from episodic digital stress to clinically significant burnout
Source: developed by the authors

Student-specific manifestations in digital learning environments

Student digital burnout is shaped by students' specific developmental and academic positions. Unlike employees with an established professional identity, students are still forming their academic self-concept, professional expectations, learning routines and autonomy. W.B. Schaufeli *et al.* (2002) conceptualised student burnout through exhaustion from study demands, cynicism toward study and feelings of inefficacy as a student. In the digital environment, these components may be intensified by constant online access to assignments, fragmented communication and the pressure to self-regulate learning without the usual spatial and temporal boundaries of campus life. Academic exhaustion is the most visible manifestation. It appears as fatigue after online lectures, difficulty concentrating on recorded materials, loss of interest in learning and the sense that every platform requires additional effort. A. Aria *et al.* (2024) identified factors affecting academic burnout in online education during the pandemic and analysed their cause-and-effect relationships using grey Delphi and grey-DEMATEL techniques. L.Z. Chong *et al.* (2025) reviewed student burnout across different populations and highlighted academic workload, perfectionism, low self-efficacy and limited support as recurring determinants. In digital learning, these factors can acquire a technological dimension: workload becomes dispersed across platforms, the possibility of endless revision reinforces perfectionism, and self-efficacy increasingly depends on students' ability to navigate digital tools.

Motivational decline is another important symptom. Students experiencing digital overload may attend online classes formally while remaining emotionally disengaged; they may keep cameras off, avoid discussion, submit minimal assignments or postpone asynchronous tasks. P.D. Deep & Y. Chen (2025) linked student burnout and mental health in higher education to online learning fatigue, insufficient institutional support and the emerging role of artificial intelligence in digital learning environments. Together, studies on student burnout suggested that exhaustion, low self-efficacy and insufficient institutional support may reduce academic engagement and performance, especially in digitally mediated learning environments. This circular dynamic is particularly dangerous in digital environments because missed online tasks accumulate quickly and remain less visible to teachers until the student is already deeply disengaged. Digital procrastination is not merely poor time management; it often serves as an avoidance strategy in response to overload. A student may postpone opening a learning platform because it is associated with unread messages, deadlines, recorded lectures and evaluation anxiety. This differs from ordinary academic procrastination because the digital interface itself becomes a trigger. When a student avoids the platform, information gaps grow; as these gaps grow, anxiety and avoidance intensify. This mechanism may explain why digital overload can transform a flexible educational environment into a source of cumulative pressure.

Another student-specific consequence is the weakening of academic identity and sense of belonging. Online learning reduces informal peer contact, spontaneous communication with teachers and embodied participation in university life. E. Marsh *et al.* (2024) demonstrated that information overload and fear of missing out are associated with stress, exhaustion and mental health risks in digital workplace environments. Although this study was conducted in a workplace context, its findings are relevant for higher education because students also experience information overload and fear of missing important digital messages. Applied to higher education, this finding highlighted that digital participation is beneficial only when it is socially meaningful, predictable and psychologically safe. If digital learning is experienced as isolated task completion, the student may gradually lose a sense of belonging to an academic community.

The Ukrainian wartime context adds specific risks. A.I. Burovytska (2024) emphasised the distinctive features of student resilience during wartime learning, while

O.A. Prokopenko (2025) documented emotional exhaustion and fatigue among students during war. L.A. Prokofieva (2024) described the psychological state of student youth under wartime conditions, including stress, psychological insecurity, distance learning challenges and somatic manifestations. In this context, war should not be treated solely as a factor that intensifies the impact of digital demands; it also serves as an independent source of several of the symptoms described above. Anxiety about personal and family safety, grief, forced displacement, interrupted study routines and air-raid-related sleep disruption arise directly from wartime conditions and would be present, at least in part, even in the absence of any digital workload. Alongside this direct pathway, war also operates as a moderator: it reduces the resources available to cope with digital demands – through unstable electricity and internet connectivity, the absence of a safe and quiet space for synchronous classes, relocation-related loss of routine, and a diminished psychological reserve for handling platform fragmentation and notification pressure – thereby amplifying the effect of a given level of digital load on exhaustion. The two pathways are not mutually exclusive: safety-related anxiety and disrupted learning routines are best explained as direct effects of war, whereas digital procrastination, fatigue from synchronous sessions and platform avoidance are better explained as digital-demand effects that war moderates rather than originates. In this context, digital burnout cannot be reduced to mere screen time; rather, it emerges at the intersection of digital learning, insecurity, disrupted routines, displacement, reduced resources and prolonged uncertainty.

Protective resources among students include resilience, academic self-efficacy, peer support, supportive teacher feedback, predictable digital course design and flexible learning formats. A.I. Burovytska (2024) and L.Z. Chong *et al.* (2025) indicated that resilience, self-efficacy and support can reduce the risks associated with academic exhaustion. However, this did not imply that students should be expected to overcome digital burnout on their own. Individual resilience was most effective when institutions provide a coherent platform architecture, accessible support, clear communication rules and opportunities for social connection. Digital burnout in higher education does not manifest in the same way among students and teachers because their institutional roles, expectations, resources and digital workloads differ structurally. Students mainly experience digital burnout due to academic self-regulation, fragmented learning tasks, evaluation pressure, and a diminished sense of belonging to the university community. Teachers, in contrast, experience it through digital pedagogical responsibility, permanent availability, platform fragmentation, administrative digitalisation and emotional labour in online interaction. Therefore, a role-sensitive comparison is necessary to avoid reducing digital burnout to a general consequence of screen time. The key differences between student-specific and teacher-specific manifestations are systematised in Table 2.

Table 2. Symptom profiles of digital burnout: student-specific and teacher-specific manifestations across functional domains

Dimension	Student-specific manifestations	Teacher-specific manifestations	Analytical implication
Emotional manifestations	Academic exhaustion; frustration with platform overload; discouragement; emotional detachment from learning; anxiety related to assessment, deadlines and uncertainty	Emotional exhaustion; digital pedagogical insecurity; frustration with constant adaptation; depersonalisation of online interaction; anxiety about teaching quality and student engagement	Emotional exhaustion is common to both groups, but students experience it mainly due to learning pressure, whereas teachers experience it primarily due to responsibility for maintaining the educational process
Cognitive manifestations	Reduced concentration; brain fog; difficulty processing recorded materials; overload from dispersed tasks; lower academic self-efficacy	Cognitive overload from multitasking during teaching, continuous monitoring of several communication channels, decision fatigue, and reduced pedagogical creativity	Cognitive overload among students is linked to fragmented learning inputs, while among teachers it is linked to simultaneous instructional, technological and administrative demands
Behavioural manifestations	Avoidance of learning platforms; postponed assignments; camera-off behaviour; minimal participation; digital procrastination	Delayed feedback, reduced consultation time, simplified online course design, avoidance of complex digital tools, and reliance on templates and routine formats	Behavioural withdrawal manifests differently: students withdraw from participation, whereas teachers reduce pedagogical complexity and interaction intensity
Social manifestations	Weakened sense of belonging; reduced peer interaction; isolation despite constant connectivity; limited informal communication with groupmates and teachers	Emotional distancing from students; reduced sense of teaching presence; interaction with silent or passive online audiences; fragmented collegial communication	Social disconnection affects both learning and teaching communities, but students lose peer belonging, while teachers lose relational feedback and professional interaction
Physiological manifestations	Headaches, eye strain, sleep disruption, musculoskeletal discomfort and fatigue are linked to prolonged digital study sessions	Physical fatigue from extended synchronous teaching; voice strain; eye strain; sleep disruption caused by late preparation, assessment or online communication	Physiological symptoms indicate that digital burnout is embodied and cannot be reduced solely to a subjective psychological complaint

Table 2. Continued

Dimension	Student-specific manifestations	Teacher-specific manifestations	Analytical implication
Role-related pressures	Formation of academic identity; pressure to self-regulate learning; uncertainty about expectations; dependence on clear digital course organisation	Responsibility for course quality; pressure to innovate digitally; administrative reporting; accountability for student outcomes and satisfaction	Role pressure explains why the same digital environment poses different risks: students must adapt to learning demands, while teachers must design and manage them
Structural factors	Limited control over course design; dependence on teacher clarity; variability in platform use across disciplines; unequal access to devices and a stable internet connection	High platform fragmentation; increased administrative workload; insufficient digital pedagogical training; institutional expectations of constant digital competence	Structural factors indicate that burnout prevention should target institutional design rather than individual coping strategies alone

Source: developed by the authors

The comparison presented in Table 2 demonstrated that student and teacher digital burnout share several mechanisms, including emotional exhaustion, cognitive overload, behavioural avoidance, social disconnection and physiological strain. However, these mechanisms have different structural origins and role-specific expressions. For students, digital burnout is closely linked to academic identity formation, demands of self-regulation, fragmented digital workloads, uncertainty about expectations, and diminished peer belonging. For teachers, it is shaped by pedagogical responsibility, platform complexity, administrative digitalisation, emotional labour and expectations of continuous availability. The role-related pressures and structural factors included in Table 2 showed that these differences are not incidental but systemic: the same digital platform imposes different demands on participants depending on their institutional role. The institutional implications of these structural differences – including risk trajectories, risk amplifiers and differentiated prevention priorities – were analysed in Table 3.

Teacher-specific manifestations and institutional consequences

Teacher digital burnout has dual significance: it harms teachers' well-being and weakens the educational environment in which students learn. Teachers are expected to redesign courses, master new tools, manage synchronous and asynchronous communication, provide rapid feedback, maintain emotional contact with students, and comply with institutional reporting requirements. O. Soroka (2025) argued that digitalisation transforms the professional activity of higher education teachers by changing teaching methods, communication formats and requirements for working with digital educational tools. For many teachers, digital transformation therefore means not only learning new tools but also reconstructing professional identity and pedagogical authority. Emotional exhaustion among teachers is often linked to the feeling of permanent availability. Online consultations, email, messenger groups, learning platforms, and administrative channels create a situation in which work can enter at any point in the day. C.B. Califf & S. Brooks (2020), in a study of K-12 teachers, found that techno-stressors are associated with burnout and turnover intention, while P. Solís *et al.* (2023) showed that perceived organisational support is closely related to teachers' technostress and should be considered when analysing institutional conditions of digital strain. These findings suggested that teacher burnout should not be individualised as a personal weakness; rather, it reflects the design of institutional demands and support systems.

Digital pedagogical insecurity is another specific manifestation. A teacher may be highly competent in face-to-face teaching but feel uncertain about online facilitation, digital assessment, multimedia content creation, or managing silent online groups. X. Yang & J. Du (2024) demonstrated that teacher self-efficacy, online pedagogical and content knowledge, and emotion regulation are significantly associated with teacher digital burnout, with emotion regulation acting as an important mediating factor. This is particularly important in higher education, where teachers often possess deep disciplinary expertise but have unequal access to training in pedagogical technology. When digital competence is perceived as insufficient, each new platform or institutional requirement may threaten professional self-esteem. Depersonalisation in digital teaching differs from depersonalisation in traditional professional burnout. It may appear as emotional distancing from students who do not turn on cameras, formalised communication, reduced empathy toward academic difficulties, or the perception that online students are less real and less responsive. I.S. Lembryk & R.Yu. Pryimak (2018) identified emotional burnout among medical university teachers before the period of forced digitalisation. This allowed digital depersonalisation to be interpreted not as a completely new problem but as a transformation of an earlier burnout risk under digital teaching conditions.

Reduced professional effectiveness is manifested in simplified online course design, repetitive digital tasks, delayed feedback, avoidance of innovative tools, and lower teaching satisfaction. A. Valiao (2025) found that faculty members may report high technostress while also perceiving high job satisfaction and improved performance due to technology integration, which showed that the relationship between technostress and professional effectiveness is complex rather than uniformly negative. At the same time, S.T. Dhayinta *et al.* (2025) emphasised that teacher burnout

during the digital transition affects the quality of learning and requires better technical support, continuous digital training, and a reduced administrative burden. Teacher burnout, therefore, becomes a student issue as well. When teachers are exhausted, they are less able to create engaging learning environments, provide timely feedback, and notice early signs of student disengagement.

Teacher burnout also has organisational consequences. D.J. Madigan & L.E. Kim (2021) showed that teacher burnout and job satisfaction are important predictors of teachers' intentions to leave the profession. L.E. Kim *et al.* (2019) demonstrated that teacher personality traits are associated with teacher effectiveness and burnout. However, these individual characteristics should not be interpreted as a substitute for reducing chronic organisational overload. C.-M. Răducu & E. Stănculescu (2022), in a study of kindergarten and primary school teachers, identified burnout profiles associated with work-related stressors, including workload, classroom resources, professional recognition needs and collegial relations. The OECD (2023) similarly showed that teachers' work-related stress is shaped by multiple layers of stressors and is associated with job satisfaction and plans to remain in the profession. Together, these findings supported the view that digital burnout is an institutional risk factor rather than merely a private psychological problem.

Institutional consequences include lower teaching quality, higher absenteeism and presenteeism, reduced innovation, conflicts with administration, weakened collegial collaboration and potential staff turnover. G. Mesh *et al.* (2025) discussed how teacher burnout may undermine instructional effectiveness, teacher-student relationships, student motivation and academic performance. A. Salama (2025) analysed tertiary teacher burnout as a complex phenomenon shaped by emotional exhaustion, motivation, professional self-achievement, administrative and collegial support, and professional development needs. For universities, this meant that digital transformation strategies must incorporate teacher well-being as a central quality criterion. The reviewed studies showed that digital burnout in higher education has a common psychological basis but different role-specific expressions. Students and teachers experience emotional exhaustion, cognitive overload and social disconnection; however, these symptoms are embedded in different institutional roles. For students, digital burnout primarily affects academic participation, self-regulated learning and academic identity formation. For teachers, it affects pedagogical confidence, professional identity, teaching quality and the capacity to support students. Therefore, Table 3 presents an authorial typology of role-specific manifestations of digital burnout in higher education.

Table 3. Analytical typology of digital burnout in higher education: role-specific institutional pressures, risk trajectories and prevention priorities

Typological dimension	Student-specific	Teacher-specific	Interpretive meaning
Role core affected	Academic participation, learning motivation, academic identity formation and self-regulated study	Professional identity, teaching quality, digital pedagogical confidence and capacity to support students	Digital burnout strikes at the central role function of each group: learning and academic development for students, teaching and pedagogical responsibility for teachers. When this core is affected, recovery requires not only symptom reduction but reconstruction of role engagement
Institutional pressure manifestation	Dependence on course clarity, limited control over digital learning design, dispersed workload across platforms and uncertainty of expectations	Platform fragmentation, administrative digitalisation, permanent availability, reporting requirements and pressure to innovate digitally	Institutional pressure is role-specific and structurally embedded: students are primarily affected by poorly coordinated digital learning environments, while teachers are affected by the expansion of invisible digital labour that is neither recognised nor bounded by policy
Long-term risk trajectory	Lower academic performance, weakened academic self-efficacy, dropout risk, negative professional expectations and delayed career development	Reduced teaching quality, lower job satisfaction, turnover intention, loss of experienced staff and weakened institutional resilience	Digital burnout accumulates into long-term academic, professional and organisational losses that extend far beyond the individual. The mutual reinforcement between student disengagement and teacher exhaustion means that unaddressed burnout in one group accelerates burnout in the other
Risk amplifiers	Perfectionism, low academic self-efficacy, lack of feedback, weak peer support, wartime instability and displacement as resource-depleting moderators of digital load, disrupted routines and safety-related anxiety as direct, digitally independent stressors that add to the symptom burden independently of digital workload	High workload; insufficient digital support; rapid technological change; institutional pressure; invisible emotional labour; permanent availability	Risk amplifiers are role-specific and require differentiated prevention strategies. For students in wartime contexts, amplifiers operate through two distinct pathways – as moderators of digital demands and as independent stressors – and prevention must address both pathways separately

Table 3. Continued

Typological dimension	Student-specific	Teacher-specific	Interpretive meaning
Protective resource configuration	Resilience, peer support, predictable course design, supportive teacher feedback, flexible learning formats and clear communication rules	Organisational support, digital pedagogical training, autonomy in course design, collegial mentoring, realistic workload and digital boundaries	Protective factors combine individual and institutional resources. Individual resilience is effective only when supported by a coherent educational environment; institutional design is the necessary condition, not an optional supplement
Priority prevention focus	Clarity of learning expectations; reduction of fragmented digital workload; flexible deadlines; strengthening peer interaction; and accessible psychological and academic support	Governance of digital workload; reduction of duplicated communication channels; pedagogical technology support; recognition of online communication as labour; institutional protection against permanent availability	Prevention must be role-sensitive rather than universal. Students need structured learning design and relational support; teachers need workload governance and institutional recognition of digital labour. Generic recommendations such as «take breaks» are insufficient for either group at the overload and burnout stages

Source: developed by the authors

Table 3 extended the descriptive comparison in Table 2 by identifying the institutional mechanisms through which digital burnout develops, and the differentiated responses required at each level. The most analytically significant finding was that digital burnout affects the core role of each group: for students, it undermines the formation of academic identity and the capacity for self-regulated learning; for teachers, it erodes pedagogical confidence and the quality of educational relationships. Both processes are self-reinforcing – burned-out teachers reduce the support available to students, while disengaged students intensify teachers' sense of inefficacy – so digital burnout must be addressed as an ecosystem-level risk rather than as a set of parallel individual problems. The typology also showed that prevention cannot be universal: students require a structured learning architecture and relational support, whereas teachers require workload governance, pedagogical technology support and institutional recognition that digital communication constitutes labour.

Prevention-oriented logic for higher education institutions

Preventing digital burnout requires a stage- and role-sensitive approach. At the stage of episodic digital stress, the most effective measures are simple and immediate: clear technical instructions, accessible support, predictable platform use and short breaks. At the stage of digital fatigue, institutions should regulate the duration and density of synchronous online sessions, encourage ergonomic practices and design timetables that allow recovery. At the stage of digital overload, individual advice is insufficient; institutions must review digital workload, reduce platform fragmentation, establish communication boundaries and provide psychological support. At the stage of burnout, professional help and organisational redesign become necessary. The first institutional priority is digital workload governance. Digital transformation often creates an invisible accumulation of micro-tasks: notifications, platform checks, repeated logins, file uploads, online forms, parallel communication channels and duplicated reporting. These tasks may appear small individually but become exhausting collectively. A. Khedhaouria & A. Cucchi (2019) showed that technostress creators and personality traits may combine into distinct configurations associated with job burnout, thereby confirming that the interaction between technological demands and individual resources shapes digital strain. P. Solís *et al.* (2023) demonstrated that perceived organisational support is closely related to teachers' technostress. Higher education institutions should therefore audit not only formal teaching hours but also the hidden digital labour required from students and teachers.

The second priority is developing digital boundaries. Boundary regulation includes rules for response time, limits on evening communication, predictable deadlines, reduced channel duplication and explicit separation between urgent and non-urgent messages. These measures are particularly important because digital platforms can normalise permanent availability. Boundary policies should protect both students and teachers: students need protected recovery time and clarity about expectations, while teachers need institutional recognition that online communication is labour. Without such recognition, digital platforms become mechanisms of techno-invasion. The third priority is support for digital competence and digital pedagogical confidence. Training should not be reduced to technical tutorials. It should include pedagogical scenarios, online interaction strategies, inclusive design, assessment integrity, emotional regulation and ways to reduce cognitive load. L. Nascimento *et al.* (2024) introduced the concept of techno-eustress among higher education teachers, showing that technology can also generate positive stress when users have sufficient resources and perceive digital demands as meaningful challenges. This insight is important because prevention should not reject digitalisation; rather, it should transform harmful digital pressure into manageable and purposeful digital engagement.

The fourth priority is social support. Digital burnout grows when individuals feel alone with digital demands. Students need peer support, mentoring, teacher feedback and opportunities for informal interaction. Teachers need

collegial communities, exchange of digital teaching practices, mentoring and administrative acknowledgement of digital labour. B. Aghayani & A. Syahid (2025), in the context of foreign language teaching, highlighted the relevance of teacher resilience for professional well-being. However, resilience should be understood not as an individual obligation but as a relational and organisational capacity. Similarly, student resilience develops more effectively when the educational environment provides psychological safety and reliable support. The fifth priority is early diagnosis. Higher education institutions can monitor non-clinical markers such as a sudden decline in attendance, delayed submissions, persistent camera avoidance, low participation, delayed teacher responses, cancellation of consultations, repeated technical frustrations and increased complaints about workload. These markers should not be used for punitive control; their purpose is to identify points where support can prevent progression from overload to burnout. The Korean version of the Digital Burnout Scale, validated by S.-Y. Choi & J.-H. Kim (2024), together with broader burnout prevention approaches, can inform the development of screening tools adapted to higher education.

The final priority is context sensitivity. In Ukraine, digital burnout prevention must consider wartime disruptions, unstable electricity and internet access, psychological insecurity, displacement and unequal access to devices. These wartime conditions should not be treated as a single undifferentiated risk category, since they affect digital burnout through two distinct pathways that require different institutional responses. Insecurity, displacement and psychological strain act directly on well-being, independently of digital workload, and call for trauma-informed communication, flexible assessment and accessible psychological counselling regardless of how digital education is organised. Unstable electricity and internet access, and unequal access to devices act as moderators that erode the resources available for coping with digital demands and call for infrastructure support, specifically reduced digital workload. Standard digital well-being recommendations may be insufficient when students and teachers are simultaneously coping with war-related stressors. Therefore, universities should combine digital workload policies with trauma-informed communication, flexible assessment, psychological counselling and infrastructure support, applying the first two measures primarily to the direct pathway and the latter two primarily to the moderating pathway. The goal is not to reduce academic standards but to make digital participation in education sustainable under exceptional conditions.

Figure 2 presents a conceptual model of digital burnout in higher education, organised by stages, role-specific manifestations and institutional outcomes. The model brought together the progression from episodic digital stress to digital fatigue, digital overload and digital burnout; the multidimensional symptom structure of this process; and the different ways in which digital burnout manifests among students and teachers. It also showed that digital burnout is shaped not only by individual reactions to technology but also by digital workload, platform fragmentation, communication norms, organisational support and contextual conditions, with wartime conditions entering the model along two separate arrows – a direct arrow into the symptom layer and a moderating arrow into the demands-resources balance – rather than a single amplifying arrow. In this sense, the model explained how digital demands and resources may lead to either a burnout trajectory or sustainable digital engagement, depending on the balance between institutional pressures and protective mechanisms.

Figure 2 demonstrates that digital burnout is not a linear psychological reaction to screen time but rather a systemic process shaped by the interplay among digital demands, individual resources, role-specific pressures, and organisational conditions. The model showed that the stages of digital strain progressed from episodic stress to fatigue, overload, and burnout, with symptoms emerging across emotional, cognitive, behavioural, social, and physiological domains. It also highlighted that students and teachers might be exposed to the same digital educational environment yet experience different mechanisms of burnout because their roles, responsibilities, and resources differ. For students, the key risks included academic exhaustion and motivational decline, digital procrastination and platform avoidance, and weakened belonging and academic identity. For teachers, the risks included emotional exhaustion, digital pedagogical insecurity, depersonalisation, administrative overload, and hidden digital labour.

The model also emphasised the decisive role of institutional structures. It distinguished organisational and contextual amplifiers – including platform fragmentation, duplicated communication, permanent availability, and insufficient support – from protective factors such as digital boundaries, training, peer and collegial support, predictable course design, and trauma-informed policies. This distinction showed that the same contextual conditions could either intensify or mitigate digital burnout, depending on whether institutional responses strengthened or depleted available resources, with outcomes ranging from a burnout trajectory to sustainable digital engagement, well-being, and learning quality. Contextual factors were especially important in Ukraine, where wartime disruptions, unstable infrastructure, displacement, and psychological insecurity reduced opportunities for recovery and increased the burden of digital participation. Within the model, this contextual influence was represented as operating along two pathways rather than as a single contextual amplifier: war contributed directly to the symptom layer – most visibly the emotional and physiological domains – regardless of digital load, and it simultaneously moderated the demands-resources balance by reducing the resources available to offset digital demands. Collapsing these two pathways into one would misrepresent the model, since interventions that strengthen digital resources (e.g., platform usability, workload governance) address only the moderating pathway and leave the direct, war-originated symptom burden untouched. Therefore, the proposed conceptual model

provided a basis for developing targeted prevention strategies that combined individual support with institutional responsibility. Such strategies should not be limited to recommendations for reducing screen time. However, they should also address the organisation of digital learning, the governance of digital workload, the recognition of hidden digital labour, and the creation of sustainable conditions for digital education.

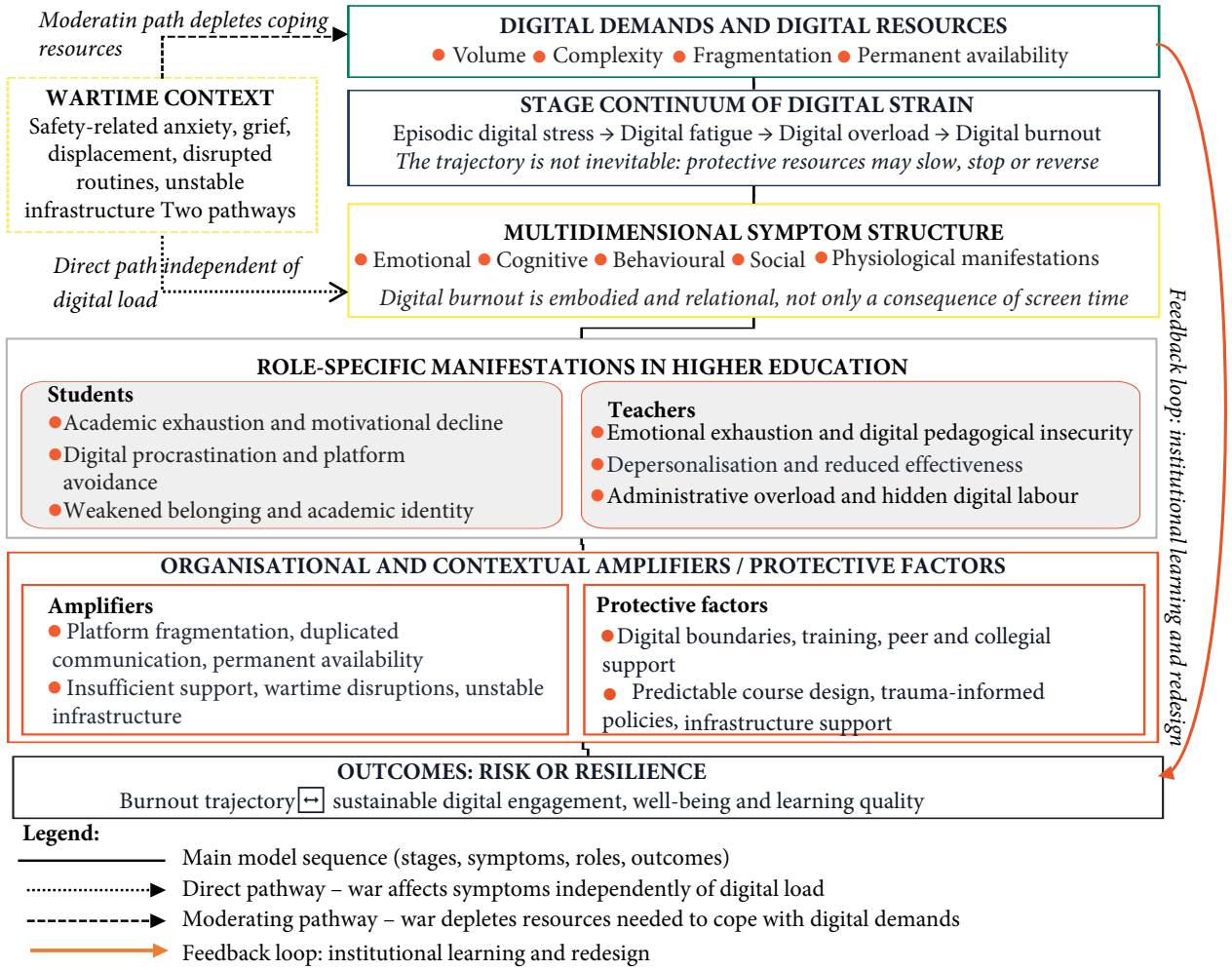

Figure 2. Conceptual model of digital burnout in higher education by stages, role-specific manifestations and institutional outcomes

Source: developed by the authors

Discussion of digital burnout as a stage-based and role-sensitive phenomenon

The results of this review confirmed that digital burnout in higher education should be understood as a distinct socio-technical form of exhaustion rather than a simple extension of general screen fatigue. The proposed distinction between episodic digital stress, digital fatigue, digital overload and digital burnout was important because it clarified different levels of severity and distinct prevention needs. This finding was consistent with the broader burnout literature, which views burnout as a chronic process rather than a sudden state. C. Leclercq & I. Hansez (2024) emphasised that burnout prevention should be adapted to temporal stages, since interventions that are useful at early stages may no longer be sufficient once chronic exhaustion has developed. Therefore, the stage continuum proposed in this article contributed to the literature by translating this temporal logic into the specific context of digitally mediated higher education.

The first important finding was that digital burnout has a multidimensional symptom structure. Emotional exhaustion, cognitive overload, behavioural avoidance, social disconnection and physiological strain did not appear as separate phenomena; rather, they reinforced one another. This interpretation was supported by research on videoconferencing fatigue. J.N. Bailenson (2021) explained Zoom fatigue through nonverbal overload, mirror anxiety, reduced mobility and increased cognitive effort, while G. Fauville *et al.* (2021) operationalised Zoom exhaustion and fatigue as a multidimensional construct. The proposed synthesis extended this logic beyond videoconferencing, showing that digital burnout in higher education encompassed not

only fatigue after synchronous online meetings but also dispersed digital tasks, platform fragmentation, permanent availability, reduced sense of belonging, and bodily discomfort. Thus, the key issue was not only the amount of time spent online but also the structure and quality of digital participation.

The second finding concerned the role of institutional design. The results showed that digital burnout was more likely when digital demands were high and institutional resources were insufficient. This aligned with the job demands-resources theory, which explains burnout as an imbalance between demands and available resources and emphasises that resources can buffer the negative effects of demands (Bakker & Demerouti, 2017). In the digital educational environment, demands include the number of platforms, task fragmentation, unclear communication rules, rapid technological change, administrative reporting and permanent availability. Resources include training, autonomy, platform usability, predictable course design, peer support, recovery time and psychological assistance. This interpretation was also consistent with the technostress literature. M. Tarafdar *et al.* (2019) distinguished techno-distress from techno-eustress, showing that technology is not inherently harmful; its effects depend on whether digital demands are perceived as manageable and meaningful. Similarly, L. Nascimento *et al.* (2024) demonstrated that techno-eustress can emerge among higher education teachers when sufficient resources are available. Therefore, the practical implication was not to reject digitalisation but to redesign it to reduce harmful pressure and strengthen meaningful digital engagement.

The third finding was that digital burnout is role-specific. Students and teachers may participate in the same digital educational environment, but they do not experience the same risks in the same way. For students, digital burnout was primarily associated with academic exhaustion, pressure to self-regulate, fragmented assignments, reduced motivation, procrastination, and a weakened sense of belonging. This finding aligns with the academic burnout literature. W.B. Schaufeli *et al.* (2002) conceptualised student burnout as study-related exhaustion, cynicism and feelings of inefficacy. A. Aria *et al.* (2024) identified factors affecting academic burnout in online education during the pandemic. It analysed their cause-and-effect relationships using the grey Delphi and grey DEMATEL techniques. At the same time, L.Z. Chong *et al.* (2025) identified academic workload, perfectionism, self-efficacy and support as recurring determinants of student burnout. The present study added that these determinants take technological form in digital learning: workload is distributed across platforms, deadlines are constantly visible, and self-efficacy depends in part on the ability to manage digital tools and communication channels.

For teachers, digital burnout was linked to a distinct configuration of pressures. It was shaped by digital pedagogical insecurity, emotional labour, permanent availability, administrative digitalisation, platform fragmentation and responsibility for learning outcomes. This finding was supported by studies showing that teacher technostress is associated with emotional exhaustion, reduced well-being and turnover intentions. C.B. Califf & S. Brooks (2020), in a study of K-12 teachers, demonstrated that techno-stressors can contribute to burnout and turnover intention when literacy facilitation is insufficient. B.-C. Chen *et al.* (2024) showed that teachers' perceived competence in using information and communication technologies is associated with lower emotional exhaustion and higher well-being, while X. Yang & J. Du (2024) linked teachers' digital burnout to self-efficacy, online pedagogical and content knowledge, and emotion regulation. These findings supported the interpretation that teacher digital burnout is not merely an individual inability to adapt to technology; it is also a consequence of how digital pedagogical work is organised, supported and recognised.

The comparison between students and teachers also showed that burnout in one group can affect the other. Burned-out teachers may provide delayed feedback, simplify digital course design, reduce consultation time and become less emotionally available to students. This can weaken student engagement and increase student uncertainty. Conversely, disengaged, silent or absent students can intensify teachers' sense of inefficacy and emotional exhaustion. G. Mesh *et al.* (2025) discussed how teacher burnout may undermine instructional effectiveness, teacher-student relationships, student motivation and academic performance, while D.J. Madigan & L.E. Kim (2021) showed that teacher burnout and job satisfaction are closely related to intentions to leave the profession. These findings indicated that digital burnout should be treated as an educational ecosystem risk rather than a private psychological difficulty. The consequences extend from individual well-being to teaching quality, student achievement, staff retention and institutional resilience.

The Ukrainian context strengthened this argument. Under wartime conditions, digital education does not function as an ordinary flexible learning format. It often serves as a continuity mechanism amid insecurity, displacement, unreliable electricity and internet access, disrupted routines and psychological strain. It was therefore necessary to distinguish two pathways through which war is connected to the manifestations described above, rather than treating it as a single undifferentiated amplifier of digital load. First, war operated as a direct, digitally independent stressor: safety-related anxiety, grief, forced displacement and interrupted study or teaching routines arose from wartime conditions themselves and would generate emotional and physiological symptoms even in the absence of any digital workload. Second, war operated as a moderator of the digital demands-resources balance: unstable electricity and internet connectivity, the absence of a safe and quiet space for synchronous participation, relocation-related disruption of routine, and a reduced psychological reserve all lowered the resources available to cope with a given level of digital demand, thereby amplifying its effect on exhaustion. The

reviewed Ukrainian literature supported both pathways, not just the second. Therefore, Ukrainian students and teachers may experience digital burnout not only due to technology use but also as part of a broader stress ecology. The reviewed Ukrainian studies on student resilience, wartime emotional exhaustion and the psychological state of student youth supported the conclusion that digital overload in Ukraine interacts with anxiety, uncertainty and reduced recovery opportunities. In contrast, a substantial part of the symptomatology they document – security-related anxiety, grief, and disruption of study and teaching routines – should be attributed directly to the war itself rather than to its interaction with digital demands. This made general digital well-being recommendations insufficient. In such a context, prevention must include trauma-informed communication, flexible assessment, infrastructure support and accessible psychological counselling.

The proposed conceptual model also had methodological significance. It linked three analytical levels often treated separately: the stage progression of burnout, its multidimensional symptom structure, and role-specific manifestations. This integration enabled the examination of digital burnout not only as a measurable psychological construct but also as a pattern of educational participation. S.-Y. Choi & J.-H. Kim (2024) validated the Korean version of the Digital Burnout Scale, indicating that the phenomenon is becoming more operationalised. However, higher education requires instruments capable of capturing the various forms of burnout among students and teachers. For students, diagnostic markers may include digital procrastination, camera avoidance, delayed submissions, reduced participation, and loss of academic belonging. For teachers, markers may include delayed feedback, reduced consultation time, simplified course design, avoidance of complex tools, and emotional distancing from students. Therefore, future diagnostic tools should be sensitive to both shared symptoms and role-specific expressions. Future Ukrainian instruments should also be able to statistically separate the direct and moderating contributions of war, rather than collapsing wartime experience into a single composite risk variable, since the present conceptual synthesis does not allow this separation to be quantified.

The findings also had practical implications for higher education management. Prevention should not be limited to individual advice, such as taking breaks, improving time management or reducing screen time. These measures may be useful in the early stages of episodic digital stress and digital fatigue, but they are insufficient when overload becomes chronic. At the institutional level, universities need digital workload governance, clearer communication rules, reduced platform fragmentation, recognition of online communication as labour, support for digital pedagogical competence and systematic monitoring of early warning signs. F. Saleem *et al.* (2024) showed that instructor and university support can buffer the negative effect of technostress on online learning quality, while P. Solís *et al.* (2023) demonstrated the importance of perceived organisational support in relation to teachers' technostress. These findings confirm that institutional support is essential for preventing digital burnout, not just an extra resource. Specifically, for Ukraine, support must target two key areas: the direct pathway – including safety, psychological first aid, and flexible routines – and the moderating pathway – encompassing infrastructure, connectivity, and quiet study and teaching spaces. Addressing digital load alone won't suffice, as it doesn't tackle symptoms caused directly by war.

At the same time, the proposed interpretation had certain limitations. The article was based on a narrative and conceptual synthesis rather than primary empirical data. Therefore, the proposed typologies and model should be treated as theoretically grounded analytical tools that require further empirical validation. Future research should test the stage continuum and role-specific markers through surveys, interviews and longitudinal studies across diverse higher education contexts. It would also be useful to compare digital burnout trajectories across stable, crisis and wartime educational environments. For Ukraine, particular attention should be paid to how infrastructural instability, displacement, security threats and hybrid learning formats shape digital exhaustion and recovery. Such studies would enable a move from conceptual systematisation to evidence-based institutional interventions. Overall, the discussion confirmed the article's central finding: digital burnout in higher education is not a purely individual reaction to technology but a systemic process shaped by the interaction of digital demands, personal and social resources, educational roles and institutional conditions. This means that responsibility for prevention cannot be placed solely on students or teachers. Sustainable digital education requires institutions to design digital environments that are pedagogically meaningful, psychologically safe, technically reliable and compatible with human recovery.

CONCLUSIONS

Digital overload and digital burnout in higher education are multidimensional phenomena that cannot be reduced to screen fatigue or insufficient digital skills. The review showed that digital burnout arises from the interplay of technological demands, educational roles, emotional labour, cognitive load, social isolation, bodily strain, and insufficient institutional support. Its manifestations include emotional exhaustion, irritability, anxiety, mental fog, attention decline, procrastination, digital avoidance, loneliness, depersonalisation of online interaction, sleep disturbance, headaches, eye strain, and psychosomatic symptoms. The article presented a stage-based continuum from episodic digital stress to digital fatigue, overload, and burnout. This continuum is important because each stage requires different preventive measures. Early digital stress may be addressed through technical support and short breaks; digital fatigue requires adjustments to workload and ergonomics; digital overload requires institutional redesign of digital demands; and digital burnout requires professional psychological help and long-term organisational changes.

The most important early markers are chronic fatigue that persists despite rest, mental fog, systematic procrastination, avoidance of digital interaction, screen-related detachment, and persistent psychosomatic symptoms.

The comparison of students and teachers demonstrated that the same syndrome has role-specific forms. Students are more vulnerable to academic exhaustion, motivational decline, digital procrastination and platform avoidance, and weakened academic identity and reduced belonging. Teachers are more vulnerable to emotional exhaustion, digital pedagogical insecurity, depersonalisation of online interaction, reduced professional effectiveness, and turnover intention. These processes are mutually reinforcing: burned-out teachers provide weaker support, while burned-out students reduce engagement and intensify teachers' sense of inefficacy. Therefore, digital burnout must be addressed within the educational ecosystem. In Ukrainian higher education, wartime conditions shaped the problem through two distinct mechanisms rather than intensification alone. War acted directly on students and teachers as an independent source of safety-related anxiety, disrupted routines, and psychological strain, while also serving as a moderator that depleted the resources (infrastructure, connectivity, recovery time) needed to cope with digital demands, thereby intensifying the impact of any given level of digital workload. Forced digitalisation, infrastructural instability, and cumulative psychological stress, therefore, combined with, rather than merely amplifying, the wartime burden itself. The practical implication was that universities should integrate digital workload governance, communication boundaries, digital competence development, social support, early diagnosis, and context-sensitive psychological services that separately addressed war-related distress and digitally mediated overload. Future research should develop validated diagnostic instruments for different groups of higher education participants, test intervention programmes in hybrid and wartime contexts, empirically disentangle the direct and moderating effects of war on digital burnout symptomatology, and examine how institutional digital policies influence long-term educational resilience.

ACKNOWLEDGEMENTS

None.

FUNDING

None.

CONFLICT OF INTEREST

None.

REFERENCES

[1] Aghayani, B., & Syahid, A. (2025). Teacher burnout and resilience. In *Positive psychology in foreign language teaching* (pp. 55-84). Hershey: IGI Global. doi: 10.4018/979-8-3373-2449-4.ch002.

[2] Aria, A., Jafari, P., & Behifar, M. (2024). Identification of factors affecting student academic burnout in online education during the COVID-19 pandemic using grey Delphi and grey-DEMATEL techniques. *Scientific Reports*, 14(1), article number 3989. doi: 10.1038/s41598-024-53233-7.

[3] Bailenson, J.N. (2021). Nonverbal overload: A theoretical argument for the causes of Zoom fatigue. *Technology, Mind, and Behavior*, 2(1), 1-6. doi: 10.1037/tmb0000030.

[4] Bakker, A.B., & Demerouti, E. (2017). Job demands-resources theory: Taking stock and looking forward. *Journal of Occupational Health Psychology*, 22(3), 273-285. doi: 10.1037/ocp0000056.

[5] Basch, J.M., Albus, P., & Seufert, T. (2025). Fighting Zoom fatigue: Evidence-based approaches in university online education. *Scientific Reports*, 15(1), article number 7091. doi: 10.1038/s41598-025-90973-6.

[6] Bobro, N.S. (2024). Features of digital transformation of higher education. *Investments: Practice and Experience*, 3, 76-80. doi: 10.32702/2306-6814.2024.3.76.

[7] Burovytska, A.I. (2024). Features of student resilience during learning in wartime conditions. *Scientific Notes. Series: Psychology*, 2, 17-23. doi: 10.32782/cusu-psy-2024-2-2.

[8] Califf, C.B., & Brooks, S. (2020). An empirical study of techno-stressors, literacy facilitation, burnout, and turnover intention as experienced by K-12 teachers. *Computers & Education*, 157, article number 103971. doi: 10.1016/j.compedu.2020.103971.

[9] Cazan, A.-M., Maican, C.I., & Cocoradă, E. (2024). Technostress and time spent online: A cross-cultural comparison for teachers and students. *Frontiers in Psychology*, 15, article number 1377200. doi: 10.3389/fpsyg.2024.1377200.

[10] Chen, B.-C., Wu, Y.-T., & Chuang, Y.-T. (2024). The impact of teachers' perceived competence in information and communication technology usage and workplace anxiety on well-being, as mediated by emotional exhaustion. *Frontiers in Psychology*, 15, article number 1404575. doi: 10.3389/fpsyg.2024.1404575.

[11] Choi, S.-Y., & Kim, J.-H. (2024). Validity and reliability of the Korean version of the digital burnout scale. *Frontiers in Public Health*, 12, 1386394. doi: 10.3389/fpubh.2024.1386394.

[12] Chong, L.Z., Foo, L.K., & Chua, S.-L. (2025). Student burnout: A review on factors contributing to burnout across different student populations. *Behavioral Sciences*, 15(2), article number 170. doi: 10.3390/bs15020170.

[13] Deep, P.D., & Chen, Y. (2025). Student burnout and mental health in higher education during COVID-19: Online learning fatigue, institutional support, and the role of artificial intelligence. *Higher Education Studies*, 15(2), article number 381. doi: 10.5539/hes.v15n2p381.

[14] Dhayinta, S.T., Nasir, M., & Zulfaida, A. (2025). Teacher burnout in the digital transition: Implications for learning quality. *Educatum: Scientific Journal of Education*, 3(1), 26-34. doi: 10.59165/educatum.v3i1.171.
[15] Dragano, N., & Lunau, T. (2020). Technostress at work and mental health: Concepts and research results. *Current Opinion in Psychiatry*, 33(4), 407-413. doi: 10.1097/yco.0000000000000613.
[16] Emmamally, W., Wentzel, D., & Brysiewicz, P. (2024). Describing Zoom exhaustion and fatigue in nursing students at a university in South Africa. *Health SA Gesondheid*, 29, article number a2675. doi: 10.4102/hsag.v29i0.2675.
[17] Fauville, G., Luo, M., Queiroz, A.C.M., Bailenson, J.N., & Hancock, J. (2021). Zoom exhaustion & fatigue scale. *Computers in Human Behavior Reports*, 4, article number 100119. doi: 10.1016/j.chbr.2021.100119.
[18] International Labour Organisation. (2017). *Working anytime, anywhere: The effects on the world of work*. Retrieved from https://www.ilo.org/publications/working-anytime-anywhere-effects-world-work/.
[19] Khedhaouria, A., & Cucchi, A. (2019). Technostress creators, personality traits, and job burnout: A fuzzy-set configurational analysis. *Journal of Business Research*, 101, 349-361. doi: 10.1016/j.jbusres.2019.04.029.
[20] Kim, L.E., Jörg, V., & Klassen, R.M. (2019). A meta-analysis of the effects of teacher personality on teacher effectiveness and burnout. *Educational Psychology Review*, 31(1), 163-195. doi: 10.1007/s10648-018-9458-2.
[21] Leclercq, C., & Hansez, I. (2024). Temporal stages of burnout: How to design prevention? *International Journal of Environmental Research and Public Health*, 21(12), article number 1617. doi: 10.3390/ijerph21121617.
[22] Lembryk, I.S., & Pryimak, R.Yu. (2018). Emotional burnout syndrome in a medical university teacher. *Medical Practice*, 5-6, 180-186. doi: 10.31640/jvd.5-6.2018(31).
[23] Li, H., & Yang, J. (2025). Managing online learning burnout via investigating the role of loneliness during COVID-19. *BMC Psychology*, 13(1), article number 151. doi: 10.1186/s40359-025-02419-3.
[24] Madigan, D.J., & Kim, L.E. (2021). Towards an understanding of teacher attrition: A meta-analysis of burnout, job satisfaction, and teachers' intentions to quit. *Teaching and Teacher Education*, 105, article number 103425. doi: 10.1016/j.tate.2021.103425.
[25] Marsh, E., Perez Vallejos, E., & Spence, A. (2024). Overloaded by information or worried about missing out on it: A quantitative study of stress, burnout, and mental health implications in the digital workplace. *SAGE Open*, 14(3). doi: 10.1177/21582440241268830.
[26] Maslach, C., & Leiter, M.P. (2016). Understanding the burnout experience: Recent research and its implications for psychiatry. *World Psychiatry*, 15(2), 103-111. doi: /10.1002/wps.20311.
[27] Mesh, G., Rivas, J., & Chan, R. (2025). The impact of teacher burnout on student achievement. *Revista El Labrador*, 10(03), 219-232. doi: 10.61285/r.e.l.-uisil.v10i03.200.
[28] Nascimento, L., Correia, M.F., & Califf, C.B. (2024). Towards a bright side of technostress in higher education teachers: Identifying several antecedents and outcomes of techno-eustress. *Technology in Society*, 76, article number 102428. doi: 10.1016/j.techsoc.2023.102428.
[29] OECD. (2023). *Unravelling the layers of teachers' work-related stress*. Paris: OECD Publishing. doi: 10.1787/bca86c20-en.
[30] Prokofieva, L.A. (2024). Features of the psychological state of student youth in conditions of war. *Higher Education of Ukraine in the Context of Integration into the European Educational Space*, 92(1(2)), 146-156. doi: 10.38014/osvita.2023.92.13.
[31] Prokopenko, O.A. (2025). Emotional exhaustion and fatigue of students during war. *Problems of Modern Transformations. Series: Pedagogy*, 7, 1-6. doi: 10.54929/2786-9199-2025-7-10-01.
[32] Răducu, C.-M., & Stănculescu, E. (2022). Teachers' burnout risk during the COVID-19 pandemic: Relationships with socio-contextual stress – a latent profile analysis. *Frontiers in Psychiatry*, 13, article number 870098. doi: 10.3389/fpsyt.2022.870098.
[33] Riedl, R. (2012). On the biology of technostress. *ACM SIGMIS Database: The Database for Advances in Information Systems*, 44(1), 18-55. doi: 10.1145/2436239.2436242.
[34] Salama, A. (2025). Tertiary teacher burnout. In *Teacher burnout from a complex systems perspective* (pp. 155-178). Cham: Springer. doi: 10.1007/978-3-031-85024-0_8.
[35] Salanova, M., Llorens, S., & Cifre, E. (2013). The dark side of technologies: Technostress among users of information and communication technologies. *International Journal of Psychology*, 48(3), 422-436. doi: 10.1080/00207594.2012.680460.
[36] Saleem, F., Chikhaoui, E., & Malik, M.I. (2024). Technostress in students and quality of online learning: Role of instructor and university support. *Frontiers in Education*, 9, article number 1309642. doi: 10.3389/feduc.2024.1309642.
[37] Schaufeli, W.B., Martínez, I.M., Pinto, A.M., Salanova, M., & Bakker, A.B. (2002). Burnout and engagement in university students. *Journal of Cross-Cultural Psychology*, 33(5), 464-481. doi: 10.1177/0022022102033005003.
[38] Solís, P., Lago-Urbano, R., & Real Castelao, S. (2023). Factors that impact the relationship between perceived organizational support and technostress in teachers. *Behavioral Sciences*, 13(5), article number 364. doi: 10.3390/bs13050364.
[39] Soroka, O. (2025). Transformation of professional activity of higher education teachers in the conditions of digitalisation. *Prospects and Innovations of Science*, 1(47), 1099-1111. doi: 10.52058/2786-4952-2025-1(47)-1099-1111.

[40] Tarafdar, M., Cooper, C.L., & Stich, J. (2019). The technostress trifecta: Techno eustress, techno distress and design: Theoretical directions and an agenda for research. *Information Systems Journal*, 29(1), 6-42. doi: 10.1111/isj.12169.
[41] UNESCO & International Task Force on Teachers for Education 2030. (2024). *Global report on teachers: Addressing teacher shortages and transforming the profession*. Paris: UNESCO. doi: 10.54675/FIGU8035.
[42] Valiao, A. (2025). Technostress and its impact on the job performance of teachers. *Journal of Interdisciplinary Perspectives*, 3(2), 352-361. doi: 10.69569/jip.2024.0692.
[43] World Health Organisation. (2019). *Burn-out an occupational phenomenon: International classification of diseases*. Retrieved from https://www.who.int/news/item/28-05-2019-burn-out-an-occupational-phenomenon-international-classification-of-diseases.
[44] Yang, X., & Du, J. (2024). The effect of teacher self-efficacy, online pedagogical and content knowledge, and emotion regulation on teacher digital burnout: A mediation model. *BMC Psychology*, 12(1), article number 51. doi: 10.1186/s40359-024-01540-z.

Людмила Романовська
Доктор педагогічних наук, професор
Хмельницький національний університет
29016, вул. Інститутська, 11, м. Хмельницький, Україна
https://orcid.org/0000-0001-7547-4575
Оксана Кравчук
Кандидат економічних наук, доцент
Київський національний економічний університет імені Вадима Гетьмана
03057, просп. Берестейський, 54/1, м. Київ, Україна
https://orcid.org/0000-0002-6337-7759
Ірина Варіс
Кандидат економічних наук, доцент
Київський національний економічний університет імені Вадима Гетьмана
03057, просп. Берестейський, 54/1, м. Київ, Україна
https://orcid.org/0000-0002-9502-5045

Цифрове перевантаження та вигорання у вищій освіті

Анотація. Актуальність дослідження зумовлена тим, що цифрове освітнє середовище у вищій освіті дедалі частіше стає джерелом не лише гнучкості навчання, а й інформаційного перевантаження, постійної доступності, фрагментації комунікації, когнітивного напруження та недостатнього відновлення студентів і викладачів. Метою статті була систематизація проявів цифрового перевантаження та цифрового вигорання у вищій освіті, визначення їхніх стадій, рольових відмінностей між студентами й викладачами та інституційних чинників, що посилюють або послаблюють ризики вигорання. У дослідженні використано наративний огляд літератури, концептуальний і порівняльний аналіз, типологічне узагальнення та моделювання. У результаті обґрунтовано, що цифрове вигорання має мультидимендійну структуру й охоплює емоційні, когнітивні, поведінкові, соціальні та фізіологічні прояви. Визначено континуум його розвитку від епізодичного цифрового стресу до цифрової втоми, цифрового перевантаження та клінічно значущого вигорання. Доведено, що ранні прояви цифрового стресу можуть бути зменшені через технічну підтримку, чіткі інструкції та короткі перерви, тоді як цифрове перевантаження й вигорання потребують перегляду цифрового навантаження, комунікаційних правил, організаційної підтримки та професійної психологічної допомоги. Розроблено авторську типологію рольових проявів цифрового вигорання: у студентів воно проявляється через академічне виснаження, цифрову прокрастинацію, зниження мотивації, послаблення навчальної ідентичності та належності до університетської спільноти; у викладачів – через емоційне виснаження, цифрово-педагогічну невпевненість, деперсоналізацію онлайн-взаємодії, приховану цифрову працю та зниження якості викладання. Запропоновано концептуальну модель цифрового вигорання у вищій освіті за стадіями, рольовими проявами та інституційними наслідками. Практична цінність дослідження полягає в обґрунтуванні диференційованих профілактичних заходів для студентів, викладачів і адміністрацій закладів вищої освіти

Ключові слова: цифрове вигорання; технострес; академічне виснаження; благополуччя викладачів; втома від онлайн-навчання; освіта в умовах війни

UDC 37.014.3:37.091
DOI: 10.52534/msu-pp2.2026.65

ISSN 2413-3329
E-ISSN 2520-6788

Natalia Nedvetska*
Assistant
National University of Life and Environmental Sciences of Ukraine
03041, 15 Heroiv Oborony Str., Kyiv, Ukraine
https://orcid.org/0000-0002-4233-168X

Interactive technologies as modern tools for preparing higher education lecturers for career guidance activities

Article's History:
Received: 05.01.2026
Revised: 27.04.2026
Accepted: 25.05.2026
Published: 29.06.2026

Suggested Citation:
Nedvetska, N. (2026). Interactive technologies as modern tools for preparing higher education lecturers for career guidance activities. *Scientific Bulletin of Mukachevo State University. Series "Pedagogy and Psychology"*, 12(2), 65-74. doi: 10.52534/msu-pp2.2026.65.

*Corresponding author (tatkashakun@gmail.com)

Abstract. This article examines the issue of preparing future higher education lecturers to carry out career guidance activities within the context of the modern educational environment. The aim of the study was to substantiate the impact of interactive technologies on the development of future higher education lecturers' readiness for career guidance activities and to determine the potential for their application in the targeted development of the relevant competences. The research was carried out in stages using methods of analysis, synthesis, generalisation, systematisation, comparison, classification and theoretical modelling based on a structural-functional approach. The feasibility of using interactive technologies as a means of developing the relevant competence has been substantiated. As a result of the analysis of academic works, the essence of interactive technologies has been clarified and they have been categorised according to their functional purpose. Groups of technologies have been identified that contribute to the development of analytical and critical thinking, communication skills, research competences, professional activity modelling, motivation and digital literacy. Based on a synthesis of academic approaches, a framework for career guidance competence in higher education institutions has been proposed, encompassing cognitive, motivational-value-based and operational-activity-based components. Theoretical modelling of the process of preparing future lecturers for career guidance activities using interactive technologies has been carried out. It has been established that the cognitive component is developed through the case study method, problem-based learning and the analysis of pedagogical situations; the motivational-value component – through discussions, training sessions, the "round table" method and debates; and the operational-activity component – through business and role-playing games, project-based technologies and the simulation of professional situations. The system of interrelationships between the components of career guidance competence and interactive technologies has been summarised, and a comprehensive model for developing a teacher's readiness for career guidance activities has been presented. As a result of the theoretical research conducted, the content and structure of a prospective higher education teacher's readiness for career guidance activities have been clarified

Keywords: innovative technology; interactive methods; career guidance competence; professional training; discussion; case study method; brainstorming

INTRODUCTION

Career guidance activities in higher education institutions have traditionally been regarded as a supplementary area, focused primarily on the pre-career choice stage. In the context of a dynamic labour market and the diversity of career paths, it is evolving into a means of supporting students' ongoing career self-determination, their adaptation

Copyright © The Author(s). This is an open access article distributed under the terms of the Creative Commons Attribution License 4.0 (https://creativecommons.org/licenses/by/4.0/)

to the demands of their chosen profession, and their orientation within the employment sector. It has been established that career guidance work in higher education institutions (HEIs) is directed not towards the choice of a profession, but towards ensuring effective self-fulfilment within the chosen specialism, which highlights the need for its systematic implementation from the very early stages of study. An analysis of current scientific research indicates a gradual expansion of this field; however, most studies focus on individual aspects of the issue.

In particular, V. Boichuk *et al.* (2023) investigated the development of career guidance competence among lecturers within the postgraduate education system. The authors experimentally demonstrated the effectiveness of organisational and pedagogical conditions that provide pedagogical support, individualisation of the educational process, a credit-based modular structure of learning, and the professional readiness of postgraduate education lecturers to carry out career guidance activities. As a result, a positive trend was observed in the development of the motivational, cognitive, activity-based and reflective components of teachers' career guidance competence. C. Joho *et al.* (2024) made an important contribution to research into teachers' professional readiness for career guidance work. Based on a systematic analysis of 31 empirical studies, they summarised contemporary approaches to the structure of lecturers' competences in the field of career guidance and found that teachers have a positive attitude towards performing career guidance functions, but feel they lack specialist knowledge and practical skills. The researchers also highlighted the insufficient development of theoretical models of professional competence and the under-representation of motivational and self-regulatory components in previous studies.

The issue of preparing teachers to carry out career guidance activities in the context of a shortage of professional career counsellors was investigated by O. Bersan *et al.* (2024). These researchers implemented an international teacher training programme in Romania and Serbia and assessed its effectiveness over a two-year period using a mixed-methods approach. The results demonstrated that organising group career guidance sessions proved to be significantly more complex than individual counselling. However, ways of improving teacher training using modern interactive technologies remained outside the scope of the study. The issue of integrating the career guidance component directly into university courses was examined by E. Gorni *et al.* (2024). Based on interviews with lecturers, educational programme coordinators and career centre staff, the researchers identified significant differences in lecturers' readiness to provide career guidance support to students, which depends largely on their professional experience and awareness of their own role in this process. On this basis, a typology of lecturers was proposed, along with practical recommendations for integrating elements of career education into academic courses.

A comprehensive analysis of the current state of career guidance in higher education was presented by C. Xie *et al.* (2026). The findings indicate a steady increase in interest in career guidance in higher education and its gradual expansion due to digital technologies. However, the study is predominantly analytical in nature and does not explore specific pedagogical mechanisms for training lecturers in career guidance activities. The importance of career guidance support for the professional development of students was substantiated by S. David & L. Mohebi (2026). Based on a thematic analysis of interviews with students and staff at HEIs in the United Arab Emirates, the authors found that effective career counselling increases awareness of career choices, promotes the personal development of students and fosters a readiness for continuous professional learning.

The researchers convincingly demonstrated that professional self-determination is significantly influenced by the family environment and the characteristics of the national labour market. An important area of contemporary research relates to the use of digital interactive technologies in career guidance. For instance, V. Tkachuk *et al.* (2024) investigated the potential of social media as a career guidance tool in HEIs. The researchers proposed a framework for utilising social platforms, covering the stages of planning, implementation, monitoring and evaluating the effectiveness of career guidance activities. Furthermore, the positive impact of social media on students' career self-determination has been experimentally confirmed. However, the researchers' primary focus was predominantly on the technological aspects of organising career guidance work.

Despite significant academic interest in the issues of career guidance and the professional training of teachers, an analysis of the sources reviewed has revealed a number of under-explored aspects of the problem under investigation. In particular, most studies focus on the development of teachers' career guidance competence, the organisational and pedagogical conditions for its development, the integration of career education into the educational process, and the use of digital tools and social media in career guidance work. However, the issue of targeted training for higher education lecturers in career guidance activities has not been sufficiently addressed, and there is virtually no comprehensive justification of the potential of interactive technologies as a means of developing their readiness to perform such functions. The pedagogical conditions and methodological approaches to the systematic use of interactive technologies in this process have not been sufficiently defined. The need to address these shortcomings determined the choice of topic and defined the aim of this study.

The aim of the study was to provide a theoretical justification of the impact of interactive technologies on developing the readiness of future higher education lecturers for career guidance activities. To achieve this aim, the following objectives were established: to analyse the current state of research on the problem; to define the nature and characteristics of interactive technologies in the context of

lecturers' professional preparation; to identify their potential for career guidance activities; and to determine their capacity to support the development of career guidance competence among HEI lecturers. The scientific novelty of the study lies in the theoretical substantiation of the potential of interactive technologies as a means of developing the career guidance competence of HEI lecturers and in clarifying the possibilities for their application within the context of professional training.

MATERIALS AND METHODS

The methodological framework of the study was based on the principles of the competence-based, systems-based, activity-based and structural-functional approaches. The research drew on academic works by scholars addressing issues relating to the professional training of higher education lecturers, the development of career guidance competence, the use of interactive technologies in vocational education, and current trends in the modernisation of the educational process in higher education (Fernandes *et al.*, 2023; Rice & Hooley, 2024; Paska, 2025). During the research, scientific articles and materials from international scientific and practical conferences were analysed, which highlight the theoretical and practical aspects of applying interactive technologies in the training of teaching staff (Gubar *et al.*, 2023; Truskavetska, 2025; Prykhodkina *et al.*, 2025).

The first stage was aimed at clarifying the nature of interactive technologies and the specific features of their use in the context of teacher training. The comparative method was used to contrast different views on the classification and purpose of interactive technologies (Kozyr, 2021; Onishchenko *et al.*, 2022; Molodovska *et al.*, 2024). The application of this method made it possible to identify common and distinct approaches to interpreting the concept of "interactive technologies", to determine the characteristics of their functioning within the educational environment of a HEI, and to identify the specific features of using various interactive forms and teaching methods in teacher training. A comparative analysis of academic approaches made it possible to identify the most common criteria for classifying interactive technologies and to establish their pedagogical potential in the development of professionally significant qualities in future teachers.

The classification method was used to organise the range of interactive tools according to their functional purpose. Using this method, interactive technologies were systematised according to the areas in which they influence the development of the cognitive, motivational-value and operational-activity components of a HEI lecturer's career guidance competence. Within the framework of this classification, groups of technologies were identified that facilitate the development of analytical thinking, professional motivation, communication skills, professional interaction skills and the ability to make pedagogical decisions in career guidance contexts. On this basis, the functional significance of individual interactive technologies was established, and the appropriateness of their use in the process of teacher training was determined.

In the second stage, an analysis was carried out of the issue of preparing HEI lecturers for career guidance activities and the role of interactive technologies in this process. To this end, methods of analysis, synthesis, generalisation and systematisation were employed. The method of analysis was used to examine the structure of a teacher's career guidance competence, to identify its main components and characteristics, and to identify the pedagogical conditions that influence the effectiveness of developing readiness for career guidance activities. During the analysis, the specific features of applying such interactive technologies as the case study method, problem-based learning, discussions, training sessions, business and role-playing games, project-based learning, the "round table" method, the analysis of pedagogical situations and the modelling of professional situations were examined.

The synthesis method enabled the integration of individual theoretical propositions into a coherent system of scientific concepts regarding the preparation of teachers for career guidance activities. This made it possible to establish interrelationships between interactive technologies and the structural components of career guidance competence. The generalisation method was used to draw conclusions regarding the potential of interactive technologies in the development of future lecturers' professional qualities and to determine their role in fostering readiness for career guidance activities. The systematisation method ensured the logical organisation of the research results, the grouping of scientific approaches and the structuring of the theoretical propositions obtained in accordance with the research objectives.

At the third stage, theoretical modelling of the process of preparing teachers for career guidance activities using interactive technologies was employed. To this end, a modelling method based on the structural-functional approach was applied. The use of the modelling method made it possible to outline a generalised structure for the development of a teacher's career guidance readiness, to identify its components, the interrelationships between them, and the corresponding interactive technologies that can be effectively used to develop each of them. During the modelling process, it was established that the case study method, problem-based learning and the analysis of pedagogical situations contribute to the development of the cognitive component of readiness; discussions, training sessions, debates and the "round-table" method facilitate the development of the motivational and value-based component; business and role-playing games, project-based techniques and the simulation of professional situations are geared towards developing the operational and activity-based component. The application of the structural-functional approach has made it possible to consider the process of developing a teacher's readiness for career guidance activities as a holistic system, within which all structural elements are hierarchically interrelated.

RESULTS

By stimulating cognitive activity and the development of professional competences, interactive technologies are an important part of the professional training of higher education lecturers. The essence of interactive learning can be understood as a set of methods, techniques and digital tools that ensure active interaction between participants in the educational process and are aimed at transforming knowledge into practical experience. At the same time, interactive learning is characterised by greater effectiveness compared with traditional methods in terms of information transfer, and by creating conditions for collaboration, reflection and the joint resolution of professionally oriented tasks (Onishchenko *et al*., 2022). It has been theoretically established that the effectiveness of interactive technologies in teacher training depends to a large extent on the level of integration of practice-oriented tasks into the content of educational components.

An analysis of academic sources revealed that interactive teaching methods stimulate learners' cognitive activity by involving them in solving professionally oriented problem situations, completing case studies, participating in discussions, business games, project work and joint decision-making. This facilitates a transition from passive assimilation of learning material to active mastery of it and further development (Onishchenko *et al*., 2022; Gubar *et al*., 2023; Truskavetska, 2025). The use of interactive technologies fosters professional reflection, the capacity for self-analysis and interpersonal communication skills. These functions are realised through the effective use of group interaction, peer assessment, discussion of activity outcomes, the reasoned defence of one's own position, and the receipt of constructive feedback from other participants in the educational process (Matiyash *et al*., 2024; Reznichenko, 2024; Kushniruk & Khorkin, 2025).

A distinctive feature of the use of interactive technologies in the training of future teachers is their focus on simulating real-life professional situations. This enables students to put their accumulated theoretical knowledge into practice. As a result, cognitive and communicative processes that are rarely utilised in traditional teaching (critical thinking, intensive communication, decision-making under time pressure) are engaged more actively (Stoika, 2024). This advantage of interactive technologies can be harnessed to develop readiness for career guidance work. To achieve this goal, it is important to create an educational environment in which every learner has the opportunity to exchange ideas, defend their own position and take an active part in the educational process (Onishchenko *et al.,* 2022). The use of interactive technologies is most effective when the educational process is organised on the basis of partnership between the teacher and the learner. In such an environment, the ability to communicate effectively in a professional context, organise career guidance activities and adapt to changing conditions in professional practice is developed.

With the aim of deepening understanding of the essence of interactive learning, a comparative analysis was carried out of the positions of various scholars regarding the classification and purpose of interactive technologies. In particular, I. Truskavetska (2025) identified such interactive technologies as the project method, the case study method, panel discussions and situational modelling. O. Gubar *et al.* (2023) proposed dividing interactive technologies into traditional and cutting-edge categories, which allows for the inclusion of both classic interactive methods (discussion, business games, etc.) and modern digital tools (social media, chatbots, etc.). This position is complemented quite naturally by the arguments of S. Kushniruk & D. Khorkin (2025), who viewed interactive methods primarily as a means of developing communicative competence and highlighted interactive technologies such as debates, gamification and chatbots. The comparative analysis carried out has shown that contemporary researchers are increasingly focusing on the integration of digital interactive tools into teacher training. This indicates a gradual expansion of the functional capabilities of interactive learning and its adaptation to the conditions of the digitalisation of education.

Thus, interactive technologies are multifunctional in nature and can be classified according to various criteria. In order to organise the wide range of interactive tools, they were classified according to their functional purpose (Table 1), which made it possible to specify the pedagogical potential of interactive technologies in the process of teacher training and to determine their impact on the development of specific components of career guidance competence. It should be emphasised that maximum effectiveness can be achieved through the integrated use of different groups of interactive technologies within a single educational component. This ensures a combination of the cognitive, motivational and practical aspects of professional training.

Table 1. Classification of interactive technologies by functional purpose

Functional purpose	Interactive technologies	Characteristics of impact
Developing analytical and critical thinking skills	Case study method, situational problem-solving tasks, brainstorming	Foster the development of the ability to analyse professional situations and make well-founded decisions.
Developing communication skills	Discussions, debates, the PRESS method, Take a Position, round-table discussions	Promote the development of argumentation skills and the ability to engage in professional dialogue.
Simulating professional practice	Business and role-playing games, situational modelling technology	Provide opportunities to recreate authentic professional practice.
Developing research skills	Project-based learning, problem-based learning	Develop the ability to independently search for information and apply it in practice.

Table 1. Continued

Functional purpose	Interactive technologies	Characteristics of impact
Increasing motivation and engagement	Gamification, training sessions, interactive exercises	Enhance learning engagement and increase motivation to learn.
Mastering information and communication technologies	Online platforms, interactive video lessons, multimedia tools, chatbots	Provide access to learning in a variety of formats and support distance interaction.

Source: compiled by the author based on research by V. Spitsyn & I. Kotyash (2023), O. Gubar *et al.* (2023), I. Truskavetska (2025)

At this stage of the research, it is important to clarify the nature of career guidance competence. It is a multi-level personality trait that combines the readiness and ability to engage in professional activity on the basis of acquired knowledge, skills, abilities and professionally relevant qualities. In this regard, the preparation of lecturers for career guidance activities emerges as a comprehensive system that involves addressing each level (component) of career guidance competence. In addition to deepening knowledge of the characteristics of students' career self-determination, career guidance competence involves providing support, counselling and the effective organisation of career guidance activities in various formats of pedagogical interaction.

The main components of career guidance competence have been identified (Fig. 1). They are all functionally interdependent. The cognitive component encompasses a body of professional knowledge regarding the theoretical foundations of career guidance, contemporary concepts of career self-determination, patterns of career development, labour market trends, the characteristics of educational programmes and occupational requirements, as well as methods of career counselling, vocational assessment and the organisation of career guidance work with students (Boichuk *et al.*, 2023; Joho *et al.*, 2024; Rice & Hooley, 2024).

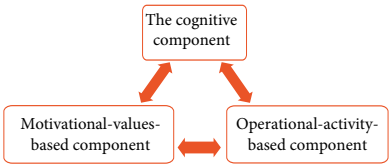

Figure 1. Structure of career guidance competence
Source: compiled by the author based on research by V. Boichuk *et al.* (2023), S. Fernandes *et al.* (2023), E. Gorni *et al.* (2024), C. Joho *et al.* (2024), S. Rice & T. Hooley (2024), O. Bersan *et al.* (2024), S. David & L. Mohebi (2026)

The cognitive component provides the foundation for the informed and competent delivery of career guidance activities. The motivational and value-based component characterises the teacher's positive attitude towards career guidance, an awareness of its social and professional significance, a willingness to take responsibility for supporting students' career self-determination, a commitment to continuous professional development, openness to pedagogical innovations, and a focus on student-centred interaction. Accordingly, this component determines the teacher's intrinsic readiness and interest in such activities (Fernandes *et al.*, 2023; Bersan *et al.*, 2024; David & Mohebi, 2026). The operational-activity component forms the basis for the practical implementation of career guidance tasks, drawing on established skills, amongst which communicative, organisational and diagnostic skills can be highlighted. This component encompasses communication skills (establishing constructive interaction, counselling, conducting professional dialogue), organisational skills (planning and conducting career guidance activities, coordinating interaction with educational institutions, employers and other stakeholders), as well as diagnostic skills, which involve identifying students' career interests, aptitudes, educational needs and level of readiness for career choices, followed by the selection of appropriate forms of career guidance support (Boichuk *et al.*, 2023; Gorni *et al.*, 2024; Joho *et al.*, 2024).

The modelling process has established that a HEI lecturer's readiness for career guidance activities is shaped by the interaction of cognitive, motivational-value-based and operational-activity-based components. The interrelationship between these components is evident in the fact that professional knowledge determines the content of practical activities, established values and motives stimulate their implementation, and practical experience deepens professional knowledge and fosters the development of reflection, ensuring the continuous improvement of career guidance competence (Boichuk *et al.*, 2023; Fernandes *et al.*, 2023; Joho *et al.*, 2024). Based on the results of theoretical modelling, it can be argued that interactive technologies have a profound impact on all components of career guidance competence. Involving teachers in the analysis of professional case studies, the simulation of career guidance situations, role-playing, group discussions, project-based activities, peer assessment and reflective discussion of learning outcomes contributes to the development of professional thinking, the formation of skills for reasoned decision-making in conditions of professional uncertainty, the improvement of communication skills, and the capacity for professional reflection and self-analysis of one's own activities (Truskavetska, 2025; Kushniruk & Khorkin,2025; Rozdymaha & Golovchenko, 2025).

Particular attention was paid during the modelling process to defining the role of interactive technologies in the development of each component of a teacher's career guidance competence. The case method and problem-based learning primarily contribute to the development of the cognitive component, as they ensure the acquisition of

knowledge regarding the principles of professional self-determination, modern approaches to career counselling, the characteristics of the labour market, and algorithms for resolving career guidance situations. Analysing alternative courses of action, justifying decisions made and forecasting their possible consequences contribute to the development of analytical and critical thinking, as well as the ability to evaluate professional situations in a reasoned manner and make pedagogically sound decisions (Onishchenko *et al.*, 2022; Truskavetska, 2025).

Group discussions, training sessions and reflective exercises primarily influence the motivational and value-based component. They promote an awareness of the social significance of career guidance, the development of positive professional motivation, a responsible attitude towards supporting learners' professional self-determination, the development of a readiness for continuous professional self-improvement, and the ability to carry out critical self-analysis of one's own professional practice through the discussion of teaching experience, peer assessment and receiving constructive feedback (Fernandes *et al.,* 2023; Kushniruk & Khorkin, 2025; Prykhodkina *et al.*, 2025).

Role-play and business games, situational modelling and project-based activities ensure the development of the operational-activity component, as they enable the practising of communication skills during career guidance consultations, organisational skills relating to the planning and implementation of career guidance activities, as well as diagnostic skills associated with the analysis of career interests, educational needs and the level of readiness of learners for career choices. On this basis, the ability to communicate professionally, make well-founded decisions quickly and respond flexibly to changing conditions of professional interaction is developed (Bersan *et al.*, 2024; Gorni *et al.*, 2024; Rozdymaha & Golovchenko, 2025). A synthesis of the results of theoretical modelling has made it possible to outline the structure of a teacher's readiness for career guidance activities, identify the interrelationships between its components, and establish interactive technologies that ensure their targeted development (Table 2).

Table 2. Interactive technologies that can be used to develop various components of career guidance activities

Component of career guidance activities	Functional purpose	Interrelationships	Interactive technologies
Cognitive	Developing a body of knowledge regarding the content, objectives and methods of career guidance activities	Forms the foundation for the development of the operational-activity component and influences the development of motivation.	Case study method, problem-based learning, analysis of pedagogical situations
Motivational-value-based	Identifying career aspirations and fostering an interest in career guidance activities	Strengthens activity within the operational-activity component and interacts with the cognitive component through the cognitive appraisal of the significance of professional activity.	Discussions, training sessions, round-table discussions, debates
Operational-activity-based	Skills and competences in career guidance work	Is grounded in the cognitive component and supported by the motivational-value component; it is closely associated with reflection on the outcomes of professional activity.	Business and role-playing games, project-based technologies, modelling of professional situations

Source: compiled by the author

The proposed model can be used in the professional training of prospective lecturers at HEIs when teaching subjects in the field of psychology and pedagogy, in particular the courses "Higher Education Pedagogy", "Teaching Methodology in Higher Education Institutions" and "Psychology of Professional Activity", as well as when organising teaching placements, conducting training sessions, seminars and workshops. Within the relevant educational components, the model can be implemented through the analysis of case studies from career guidance practice, the simulation of consultations with prospective students, role-play and business games, the development and presentation of career guidance projects, the conduct of group discussions, and the analysis of professional situations. The model can be adapted to the conditions of distance and blended learning through the use of digital interactive platforms, video conferencing services, online discussions, virtual modelling of professional situations, collaborative project work, electronic portfolios and tools for prompt feedback. In this way, active interaction between participants in the educational process can be ensured, regardless of the learning format (Tkachuk *et al.*, 2024; Molodovska *et al.*, 2024; Pertseva *et al.*, 2025).

The practical value of the model lies in its applicability during the development of educational programmes, teaching and learning materials, and a system for assessing the level of career guidance competence among future teachers. Assessment can be carried out according to three interrelated criteria: cognitive (level of knowledge regarding the theoretical foundations of career guidance, career counselling and current labour market trends), motivational-value-based (level of professional motivation, awareness of the significance of career guidance activities, and readiness for professional self-development) and operational-activity-based (the development of communicative, organisational and diagnostic skills, the ability to plan, organise and implement career guidance activities, analyse the professional needs of learners and make informed

pedagogical decisions). The results of case studies, role-plays, project work, professional portfolios, self-assessment, expert evaluation and pedagogical observation of learners' activities can be used as indicators of the development of these criteria. Thus, specific interactive technologies have been identified that ensure the development of each component of career guidance activities. The presented system for utilising interactive technologies reflects the integrity and dynamism of the process of developing career guidance competence.

DISCUSSION

The results obtained during the study allow to examine the issue of preparing HEI lecturers for career guidance activities through the prism of the use of interactive technologies. The research findings correlate to some extent with the work of other researchers, providing a basis for a broader academic discussion. At the same time, this study not only confirms the existing claims in the academic literature regarding the effectiveness of interactive learning, but also specifies the mechanisms through which it influences the development of career guidance competence among higher education lecturers. The findings indicate that interactive technologies should be regarded not as isolated methodological techniques, but as a systematic tool for professional training, capable of ensuring the integration of the cognitive, motivational-value and operational-activity components of a lecturer's professional readiness.

In particular, C. Joho *et al.* (2024) emphasised the multi-component structure of the competences realised in the process of career guidance, which corresponds to the cognitive, motivational-value-based and activity-based components identified in present research. The authors emphasise the importance of combining knowledge and skills. At the same time, this study devotes considerably less attention to the means of developing these components. In the present study, this issue was addressed in detail by identifying specific interactive technologies that facilitate the development of each component of career guidance competence. Thus, the findings of this study complement the conclusions of the aforementioned researchers with a practice-oriented aspect, enabling the specification of methods for implementing the competence-based approach within the teacher training system.

In the context of the present study, the findings of C. Xie *et al.* (2026) were of particular interest. Through bibliometric analysis, these researchers identified growing scholarly attention to career guidance in higher education and the increasing use of digital and visualisation tools within the educational process. This points to the potential for the effective application of interactive technologies and highlights their important role within the contemporary educational environment. It should be noted that the findings of the present study extend these conclusions by not only confirming the growing prevalence of such technologies but also providing a systematic classification of interactive technologies according to their functional purpose within the professional preparation of lecturers. Furthermore, the results suggest a gradual shift in emphasis from the isolated use of individual digital tools towards the creation of an integrated interactive learning environment in which digital technologies are combined with traditional interactive teaching methods.

It can be argued that the data obtained during the study complement the findings of S. David & L. Mohebi (2026). These researchers concluded that career guidance has a significant impact on the career choices and professional development of students. At the same time, according to the researchers, preparing teachers for such activities takes on not only pedagogical but also social significance. One can generally agree with the thesis regarding the need for the targeted development of teachers' readiness to perform career guidance functions, in particular through the use of interactive technologies. Within the framework of the present research, this issue is further specified by identifying the relationships between interactive technologies and the development of professionally significant qualities of lecturers, including communicative competence, the capacity for professional reflection, and the ability to organise effective professional interaction with learners.

The views expressed by E. Gorni *et al.* (2024) regarding the need to integrate career guidance components into university curricula are consistent with the ideas presented in this study. In particular, these researchers emphasised the importance of embedding career guidance elements within the educational process of HEIs in order to help learners better navigate their future professional pathways. The findings of the present study extend this proposition by demonstrating that the effectiveness of such integration depends to a considerable extent on the selection of appropriate interactive technologies and on lecturers' readiness to use them effectively. For this reason, the career guidance component should be integrated not only into the content of individual academic disciplines but also into the broader system of teaching practice, training activities, and extracurricular educational work.

Of particular relevance to the subject under consideration is the conclusion reached by T. Paska (2025) regarding the need for a systematic and integrated approach to combining career guidance activities with the educational process, as well as its close links with employers and professional communities. Such integration should be implemented not only at the level of organising events, but also at the methodological level, ensuring the continuous improvement of the content and methods of teacher training. The experience of the Vasyl Stefanyk Precarpathian National University, described in the study, deserves special attention, as it demonstrates the effectiveness of a comprehensive approach to career guidance work. The implementation of initiatives such as career guidance days, participation in nationwide projects and the organisation of specialised centres demonstrates the effectiveness of combining informative and interactive forms of work. This confirms the findings that interactive technologies create conditions for

students to immerse themselves in a professional environment and contribute to the development of their career orientations. The findings of the present study further refine these conclusions by placing the lecturer at the centre of career guidance activities. Whilst T. Paska's (2025) work places the main emphasis on the organisational and institutional level of implementing innovative technologies, the present study highlights the importance of developing the teacher's individual readiness for their purposeful application. The present study also provides grounds for asserting that the effectiveness of career guidance activities is largely determined not only by the availability of modern technological resources, but also by the teacher's ability to adapt interactive methods to specific educational situations and the professional needs of learners.

At the same time, the study's findings correlate with the conclusions of V. Boichuk *et al.* (2023), who emphasised the need for specialised training of teachers in career guidance within the postgraduate education system. In the context of this study, this issue is considered more broadly, as interactive technologies are viewed as a universal tool for the continuous professional development of lecturers, which can be utilised both during initial teacher training and in professional development programmes. This approach ensures that lecturers' professional competences are constantly updated in line with changes in the modern educational environment. To some extent, the study's findings are also consistent with the conclusions of S. Fernandes *et al.* (2023), who demonstrated the positive impact of pedagogical training on the professional development of higher education lecturers. This confirms the value of using interactive technologies as a tool for professional self-development and the refinement of lecturers' pedagogical skills. In particular, interactive forms of teaching contribute to the development of the ability for professional reflection, self-assessment of performance, and the formation of interpersonal interaction skills.

The findings of studies by V. Matiyash *et al.* (2024), N. Prykhodkina *et al.* (2025) and E. Rozdymaha & D. Golovchenko (2025), who emphasised the importance of interactive technologies for the development of general cultural, academic and professional competences among future teachers. A comparison of these findings with the results of the present study suggests that interactive technologies possess universal pedagogical potential and can be effectively utilised in various areas of teacher training, including career guidance. Another important aspect of the current academic debate is the issue of the digitalisation of career guidance. In this context, the findings of the study by V. Tkachuk *et al.* (2024), who examined social media as a tool for career guidance in higher education, are worthy of attention. This confirms the relevance of integrating digital interactive technologies into the system of lecturers' professional training. At the same time, based on the findings, it can be concluded that the use of digital tools will be effective provided they are combined with traditional interactive teaching methods in a pedagogically sound manner. Thus, a comparison of the findings with the conclusions of other researchers demonstrates their complementary nature. Interactive technologies are indeed a key factor in enhancing the effectiveness of career guidance activities; however, their effectiveness depends significantly on the level of the teacher's preparedness to use these tools appropriately. The present study suggests that interactive technologies have considerable potential for developing lecturers' professional readiness for career guidance activities; however, their effective application requires systematic methodological support, integration into educational programmes, and the creation of a holistic interactive educational environment within HEIs.

CONCLUSIONS

The findings of the study include a comparative analysis of scholarly approaches to defining the nature and classification of interactive technologies, which made it possible to establish their multifunctional character and the diversity of their application within the educational process. On this basis, a classification of interactive technologies has been developed according to their functional purpose, which systematises them in accordance with the areas in which they influence the development of the professional qualities of future lecturers. The results obtained suggest that interactive technologies possess significant pedagogical potential in the context of the professional training of higher education lecturers, as they combine theoretical training with practice-oriented activities, stimulate cognitive processes and contribute to the development of professional reflection. It was also established that the greatest effectiveness in professional training was achieved through the comprehensive use of various interactive technologies, integrated into a coherent system of educational interaction.

The study clarified the nature of career guidance competence among higher education lecturers and substantiated its structure, which encompasses cognitive, motivational-value and operational-activity components. It has been demonstrated that readiness for career guidance activities is formed as a result of the interaction between these components. The content of each structural component of career guidance competence has been specified, and their functional interdependence has been identified. The cognitive component ensures the development of a system of professional knowledge regarding the content, forms and methods of career guidance activities; the motivational-value component determines the level of professional orientation and readiness to carry out career guidance work; the operational-activity component encompasses the practical skills and abilities required to organise professional interaction, communication and pedagogical support for learners.

Based on theoretical modelling, the possibilities for developing a teacher's readiness for career guidance activities using interactive technologies have been demonstrated. In doing so, the interrelationships between the structural components of career guidance competence and the

corresponding groups of interactive technologies have been identified. In particular, it has been established that the case study method, problem-based learning and the analysis of pedagogical situations facilitate the development of the cognitive component; discussions, training sessions, the "round table" method and debates – the motivational-value component; and business and role-playing games, project-based technologies and the modelling of professional situations – the operational-activity component. Modelling has made it possible to justify the feasibility of systematically combining interactive technologies within the framework of teacher training. Their use ensures the creation of an educational environment that is as close as possible to the real conditions of professional practice.

The study also expanded current understanding of the systematic application of interactive technologies in the preparation of future lecturers. The effectiveness of these technologies largely depends on the quality of methodological support within the educational process, the consistency with which interactive methods are implemented, and their alignment with the professional objectives of lecturer preparation. The practical significance of the findings lies in the possibility of applying the proposed system of interactive technologies in teaching psychological and pedagogical disciplines, organising teaching practice, conducting training sessions, and implementing professional development programmes for HEI lecturers. The study also substantiated the feasibility of adapting the proposed model to distance and blended learning environments through the use of digital interactive tools, online platforms, and virtual communication technologies. Future research should focus on developing criteria and indicators for assessing the level of readiness for career guidance activities, as well as further clarifying the role of digital interactive tools within this process.

ACKNOWLEDGEMENTS

None.

FUNDING

None.

CONFLICT OF INTEREST

None.

REFERENCES

[1] Bersan, O.S., Lustrea, A., Sava, S., & Bobic, O. (2024). Training teachers for career guidance of high school students. *Education Sciences*, 14(3), article number 289. doi: 10.3390/educsci14030289.

[2] Boichuk, V.B., Boichuk, O.B., & Hura, A. (2023). Preparation of teachers in postgraduate education institutions for career guidance work. *Pedagogical Sciences: Theory, History, Innovative Technologies*, 4(128), 437-451. doi: 10.24139/2312-5993/2023.04/437-451.

[3] David, S.A., & Mohebi, L. (2026). Implications of career guidance on career choices and professional development: Stakeholders' perspectives from selected higher educational institutions in the UAE. *Social Sciences & Humanities Open*, 13, article number 102594. doi: 10.1016/j.ssaho.2026.102594.

[4] Fernandes, S., Araújo, A.M., Miguel, I., & Abelha, M. (2023). Teacher professional development in higher education: The impact of pedagogical training perceived by teachers. *Education Sciences*, 13(3), article number 309. doi: 10.3390/educsci13030309.

[5] Gorni, E., Vignoli, M., & Di Stasi, M. (2024). Including career guidance in university courses: The instructor perspective. *CERN IdeaSquare Journal of Experimental Innovation*, 8(3), 84-92. doi: 10.23726/cij.2024.1575.

[6] Gubar, O.G., Spitsyn, V.V., & Kotyash, I.S. (2023). The impact of the use of interactive technologies on the quality of teaching of future teachers in higher education institutions. *Academic Visions*, 26. doi: 10.5281/zenodo.10461085.

[7] Joho, C., Mok, S.Y., Höfelner, C., & Düggeli, A. (2024). Analyzing teachers' competencies in career guidance: A systematic review. *Frontiers in Education*, 9, article number 1488662. doi: 10.3389/feduc.2024.1488662.

[8] Kozyr, M.V. (2021). Application of interactive learning technologies in the educational process of higher education institutions. *Pedagogy of the Formation of a Creative Personality in Higher and General Education Schools*, 78, 186-191. doi: 10.32840/1992-5786.2021.78.33.

[9] Kushniruk, S., & Khorkin, D. (2025). Innovative technologies as a means of forming communicative competence of future teachers of higher education institutions. *Youth and Market*, 3(235), 12-17. doi: 10.24919/2308-4634.2025.325686.

[10] Matiyash, V., Gladyuk, T., Gladyuk, M., Bankovsky, A., & Vodyana, V. (2024). Interactive technologies in the formation of general cultural competence of future teachers. *Youth and Market*, 6(226), 147-152. doi: 10.24919/2308-4634.2024.307880.

[11] Molodovska, Y., Vainola, R., Lisnevska, N., Biriuk, L., Kostenko, L., & Bosyi, O. (2024). Use of interactive technologies in an innovative educational environment. *Revista Eduweb*, 18(3), 134-156. doi: 10.46502/issn.1856-7576/2024.18.03.11.

[12] Onishchenko, T.Ye., Ryabokon, O.V., Helemendyk, A.B., Savelyev, V.G., & Glaktionov, A.G. (2022). The use of interactive teaching methods in the formation of professional competencies in students of higher education institutions. *Higher Education of Ukraine in the Context of Integration into the European Educational Space*, 89(2), 90-96. doi: 10.38014/osvita.2022.89.08.

[13] Paska, T. (2025). Innovative educational technologies in career guidance activities of higher education institutions. *New Pedagogical Idea*, 123(3), 46-53. doi: 10.37026/2520-6427-2025-123-3-46-53.

[14] Pertseva, T.O., Sanina, N.A., & Turlyun, T.S. (2025). Interactive technologies in education: Digital tools for active learning of higher education students. *Medical Education*, 1, 78-82. doi: 10.11603/m.2414-5998.2025.1.15376.
[15] Prykhodkina, N., Tsynova, M., Kravets, H., Hrechanovska, O., & Nichyshyna, V. (2025). The role of interactive technologies in improving the quality of learning and development of scientific competencies in modern education. *Periodicals of Engineering and Natural Sciences*, 13(1), 69-82. doi: 10.21533/pen.v13.i1.253.
[16] Reznichenko, I.G. (2024). The use of interactive teaching methods in the process of forming project competence of future teachers. *Pedagogical Academy: Scientific Notes*. doi: 10.5281/zenodo.14262899.
[17] Rice, S., & Hooley, T. (2024). How can and should secondary school teachers be involved in building students' career knowledge and skills? A Delphi study of the expert community. *Journal of Education and Work*, 37(5-6), 483-501. doi: 10.1080/13639080.2025.2456849.
[18] Rozdymaha, E., & Golovchenko, D. (2025). Peculiarities of using interactive technologies in the process of training future teachers. *Teacher Professionalism: Theoretical and Methodological Aspects*, 1(23), 143-156. doi: 10.31865/2414-9292.23.2025.334060.
[19] Stoika, O. (2024). Interactive learning technologies as a tool for optimizing vocationally oriented English teaching in higher education institutions. *Knowledge, Education, Law, Management*, 7(67), 32-37. doi: 10.51647/kelm.2024.7.5.
[20] Tkachuk, V.V., Yechkalo, Y.V., Bielikova, O.A., Kolomoiets, T.H., Zinchenko, V.M., & Semerikov, S.O. (2024). Social media as a tool for career guidance in higher education. In *AREdu 2024: 7th international workshop on augmented reality in education* (pp. 282-292). Kryvyi Rih: CEUR Workshop Proceedings.
[21] Truskavetska, I. (2025). Interactive learning technologies as a means of forming professional competencies in future teachers of natural sciences. *Acta Paedagogica Volynienses*, 2, 124-129. doi: 10.32782/apv/2025.2.17.
[22] Xie, C., Jamaludin, K.A., & Ismail, H.H. (2026). A visualization analysis of career guidance in higher education: Using Citespace. *Discover Education,* 5, article number 72. doi: 10.1007/s44217-025-01090-5.

Наталія Недвецька
Асистент
Національний університет біоресурсів і природокористування України
03041, вул. Героїв Оборони, 15, м. Київ, Україна
https://orcid.org/0000-0002-4233-168X

Інтерактивні технології як сучасні засоби підготовки викладача закладу вищої освіти до профорієнтаційної діяльності

Анотація. У статті розглядається проблема формування готовності майбутнього викладача закладу вищої освіти до здійснення профорієнтаційної діяльності в умовах сучасного освітнього середовища. Метою роботи було обґрунтування впливу інтерактивних технологій на розвиток готовності майбутнього викладача закладу вищої освіти до профорієнтаційної діяльності та визначення можливості їх застосування для цілеспрямованого формування відповідної компетенції. Дослідження виконано поетапно із застосуванням методів аналізу, синтезу, узагальнення, систематизації, порівняння, класифікації та теоретичного моделювання на засадах структурно-функціонального підходу. Обґрунтовано доцільність використання інтерактивних технологій як засобу розвитку відповідної компетентності. У результаті аналізу наукових праць уточнено сутність інтерактивних технологій та впорядковано їх за функціональним призначенням. Виокремлено групи технологій, що сприяють розвитку аналітичного й критичного мислення, комунікативних умінь, дослідницьких компетентностей, професійного моделювання діяльності, мотивації та цифрової грамотності. На основі узагальнення наукових підходів запропоновано структуру профорієнтаційної компетентності закладів вищої освіти, що охоплює когнітивний, мотиваційно-ціннісний та операційно-діяльнісний компоненти. Здійснено теоретичне моделювання процесу підготовки майбутнього викладача до профорієнтаційної діяльності із застосуванням інтерактивних технологій. Визначено, що розвиток когнітивного компонента забезпечується через кейс-метод, проблемне навчання та аналіз педагогічних ситуацій; мотиваційно-ціннісного – через дискусії, тренінги, метод «круглого столу» та дебати; операційно-діяльнісного – через ділові й рольові ігри, проєктні технології та моделювання професійних ситуацій. Узагальнено систему взаємозв'язків між компонентами профорієнтаційної компетентності та інтерактивними технологіями й представлено цілісну модель формування готовності викладача до профорієнтаційної діяльності. У результаті проведеного теоретичного дослідження уточнено зміст і структуру готовності майбутнього викладача закладу вищої освіти до профорієнтаційної діяльності

Ключові слова: інноваційна технологія; інтерактивні методи; профорієнтаційна компетентність; професійна підготовка; дискусія; кейс-метод; мозковий штурм

UDC 811.111'243:37.013:81'25
DOI: 10.52534/msu-pp2.2026.75

ISSN 2413-3329
E-ISSN 2520-6788

Raising grammatical awareness through translation in the EFL classroom

Maryna Zembytska*
PhD in Pedagogy, Associate Professor
Khmelnytskyi National University
29016, 11 Instytutska Str., Khmelnytskyi, Ukraine
https://orcid.org/0000-0002-6671-9937

Andrii Goroshko
Doctor of Technical Sciences, Professor
Khmelnytskyi National University
29016, 11 Instytutska Str., Khmelnytskyi, Ukraine
https://orcid.org/0000-0002-1386-2326

Article's History:
Received: 05.01.2026
Revised: 30.03.2026
Accepted: 25.05.2026
Published: 29.06.2026

Suggested Citation:
Zembytska, M., & Goroshko, A. (2026). Raising grammatical awareness through translation in the EFL classroom. *Scientific Bulletin of Mukachevo State University. Series "Pedagogy and Psychology"*, 12(2), 75-83. doi: 10.52534/msu-pp2.2026.75.

*Corresponding author
(marynazembytska@gmail.com)

Abstract. The development of students' grammatical competence remains a key objective in teaching English as a foreign language, particularly in contexts where substantial structural differences emerge between Ukrainian and English. Effectively overcoming cross-linguistic interference requires the implementation of new cognitively-oriented methodological approaches. The purpose of this article was to investigate the pedagogical potential of translation exercises in raising metalinguistic awareness and developing the grammatical competence of future philologists. To achieve this objective, a quasi-experimental mixed-methods research design involving 24 (first- and second-year) students at Khmelnytskyi National University was employed, combining pre-test and post-test assessments with the analysis of reflective journals. The instructional framework integrated elements of contrastive analysis, collaborative translation, and back-translation within task-based pedagogy. The specific characteristics of typical grammatical transformations were analysed, focusing on voice shifts, word order transformations, nominal-verbal restructuring, additions and omissions, and article-related structures. It was established that the systematic use of targeted translation tasks leads to a substantial improvement in learners' linguistic accuracy, raising the average test score from 55% to 81%. It was proven that translation-based activities stimulate deep cognitive processing of material and activate the Noticing Hypothesis in second language acquisition. A four-stage pedagogical model for integrating translation exercises into practical grammar instruction was developed and theoretically justified. It was found that the proposed tasks effectively transform students' intuitive inner translation into conscious analytical language awareness. The research results can be directly utilised by university lecturers and methodologists to modernise curricula for practical English grammar

Keywords: translation-based instruction; grammatical transformations; metalinguistic awareness; teaching methods; classroom research

INTRODUCTION

Developing grammatical competence remains a fundamental objective in foreign language teaching. While communicative approaches emphasise interaction and fluency, learners often experience difficulties when dealing with complex grammatical structures in both spoken and written communication. These difficulties are particularly evident when students attempt to express ideas accurately in the target language. One of the main reasons for such challenges lies in structural differences between the learners' first language and the target language. Ukrainian and

Copyright © The Author(s). This is an open access article distributed under the terms of the Creative Commons Attribution License 4.0 (https://creativecommons.org/licenses/by/4.0/)

English differ significantly in their grammatical systems, including word order, morphological structure, and the use of grammatical categories such as tense, aspect, and articles. As a result, learners frequently rely on direct transfer from their native language, which may lead to grammatical errors.

In this context, translation can serve as an effective pedagogical tool that enables learners to compare linguistic systems and analyse structural differences between languages. Translation tasks require learners to consider not only lexical meaning but also grammatical relationships and syntactic patterns. Through this process, students become more aware of the grammatical transformations necessary to convey meaning accurately across languages. Recent analyses of pedagogical and psycholinguistic research in EFL contexts reveal that translation remains a core research topic, particularly in relation to its role in developing learner proficiency, grammatical awareness, and analytical skills. Multiple studies further confirm a renewed scholarly interest in the use of translation in foreign language pedagogy. In particular, C. Rossi *et al.* (2021) argued that translation is currently being "rehabilitated" as a meaningful classroom practice within holistic and ecological approaches to language learning.

From a historical perspective, the role of translation in foreign language education has undergone substantial reconsideration over the past decades. While traditional Grammar-Translation pedagogy relied heavily on translation as a central instructional technique, communicative approaches emerging in the late twentieth century largely discouraged the use of learners' first language (L1). A broader theoretical reconsideration of translation in foreign language pedagogy has also taken place over the last two decades. Once strongly associated with the Grammar-Translation Method and therefore excluded from communicative language teaching, translation is now increasingly viewed as a legitimate pedagogical resource that supports language awareness, mediation, and multilingual competence. This theoretical shift has also led to greater conceptual precision regarding the pedagogical functions of translation. This reconceptualisation positions translation as a means of fostering grammatical awareness, metalinguistic reflection, and communicative competence in EFL learners. This perspective is supported by N. Sifakis (2023), who argues that mere exposure to English discourse is insufficient for developing deep language awareness. Instead, learners must be guided toward conscious reflection through structured activities that foreground their experience as language users and decision-makers. S. Kordia (2020) examined the integration of English as a Lingua Franca (ELF) awareness into task-based language teaching. The study explored how communicative tasks exposing learners to diverse English varieties could foster language awareness, metalinguistic reflection, and intercultural competence. The findings indicated that ELF-oriented tasks encouraged learners to critically evaluate language variation, increased tolerance of linguistic diversity, and promoted greater metalinguistic awareness while supporting communicative competence. Y. Ping (2026) re-examined the pedagogical role of translation in contemporary foreign language education by reviewing its development from the grammar-translation tradition to modern communicative approaches. The study concluded that translation should be regarded as a pedagogical resource rather than an outdated method, as carefully designed translation activities contribute to grammatical accuracy, lexical development, intercultural competence, and conscious reflection on cross-linguistic similarities and differences. L. Asquerino Egoscozábal & J.L. Estrada Chichón (2023) conducted a systematic review of empirical studies on pedagogical translation published during the preceding five years. The review analysed research designs, educational contexts, translation tasks, and reported learning outcomes. The findings demonstrated that pedagogical translation consistently enhanced vocabulary acquisition, grammatical competence, metalinguistic awareness, intercultural competence, and mediation skills. The review also highlighted the need for more rigorous experimental research employing standardised assessment procedures. L. Orland-Barak & C. Fuchs (2023) investigated the effects of translation-based writing tasks on noticing and metalinguistic awareness among Arabic-speaking pre-service teachers of Hebrew as a second language. The study examined how translation activities combined with guided reflection influenced learners' awareness of linguistic structures during the writing process. The findings showed that translation facilitated deeper noticing of cross-linguistic differences, strengthened metalinguistic awareness, improved revision strategies, and enhanced the overall quality of second-language writing. A. Belhadia (2024) examined practical approaches to integrating translation into English as a Foreign Language (EFL) instruction by synthesising contemporary theoretical and pedagogical evidence. The study proposed a framework for selecting and implementing translation tasks according to instructional objectives and learner proficiency. The findings suggested that translation activities were most effective when integrated with communicative language teaching, supporting the development of lexical, grammatical, pragmatic, and intercultural competence while encouraging conscious language awareness rather than mechanical language transfer.

Furthermore, empirical findings by X. Huang (2022) show that allowing learners to draw on their full linguistic repertoire improves comprehension and facilitates language acquisition. Within this paradigm, the traditional "monolingual principle" is increasingly questioned, and translation is reinterpreted not as interference but as a scaffolding mechanism supporting syntax acquisition. Recent empirical work by M. Bader *et al.* (2026) further extends this perspective by shifting attention from translation as an individual written activity to a collaborative and socially mediated process. Their study of young EFL learners found that translation tasks conducted in pairs or small groups generated rich metalinguistic talk, as learners negotiated grammatical and lexical choices and justified their

decisions to one another. This aligns with sociocognitive frameworks in which interaction helps learners externalise their reasoning and transform implicit knowledge into explicit linguistic competence.

Despite these advances, a significant research gap remains in systematic studies focusing on Ukrainian EFL learners, particularly in relation to specific grammatical transformation exercises. Much of the existing literature is based on Spanish-English or Chinese-English language pairs, leaving the Slavic-English interface underexplored. This gap highlights the need for further research into how structured translation tasks can systematically highlight cross-linguistic differences and support targeted grammatical development. The purpose of this article was to examine the pedagogical potential of translation activities for raising students' awareness of grammatical transformations in the EFL classroom and to propose a model for integrating translation tasks into grammar instruction.

MATERIALS AND METHODS

The present study employed a quasi-experimental mixed-methods classroom-based research design aimed at investigating the effectiveness of translation-based instruction in raising students' awareness of grammatical transformations in the EFL classroom. The empirical part of the study was conducted during the second semester of the 2025-2026 academic year at Khmelnytskyi National University. The participants included 11 first- and 13 second-year undergraduate students, aged 18-20, enrolled in the educational programmes Secondary Education (English Language and Foreign Literature) and Philology (Applied Linguistics). All participants had previously completed foundational grammar courses and demonstrated an upper-intermediate (B2) level of English proficiency according to the Common European Framework of Reference for Languages (CEFR). The study was conducted in compliance with international ethical standards for research involving human participants. Written informed consent was obtained from all students prior to the experiment, ensuring voluntary participation, anonymity, data confidentiality, and the right to withdraw at any stage without pedagogical penalty, adhering to the Ethical guidelines for educational research (British Educational Research Association, 2024).

The intervention lasted six weeks and consisted of twelve 80-minute instructional sessions integrated into the regular EFL grammar course English Grammar for Communication. During this period, translation-based grammar activities were systematically incorporated into classroom instruction. To ensure methodological rigor, the study combined quantitative and qualitative data collection procedures. The quantitative component involved a pre-test/post-test design. At the beginning of the study, students completed a diagnostic grammar awareness test consisting of 20 tasks designed to assess their ability to identify and perform grammatical transformations between English and Ukrainian. The test included sentence transformation tasks, guided translation tasks, error correction exercises, and back-translation items. The assessed grammatical categories included: word order transformations; tense and aspect shifts; passive voice transformations; article use; nominalisation and verbalisation; additions and omissions. The grammatical transformation categories assessed in this study draw on the classification proposed by I.V. Korunets (2003), who identifies transposition, grammatical replacement, addition, omission, and partitioning as the principal types of transformation occurring in English-Ukrainian translation. Typical addition-omission pairs used in the exercises included restoring obligatory English function words absent from Ukrainian syntax and omitting redundant elements when translating into the more synthetic Ukrainian structure. The intervention was structurally organised. Prior to the performance evaluation, as illustrated below in Figure 1, the participants completed a sequential progression of pedagogically structured translation tasks designed to activate distinct levels of syntactic processing:

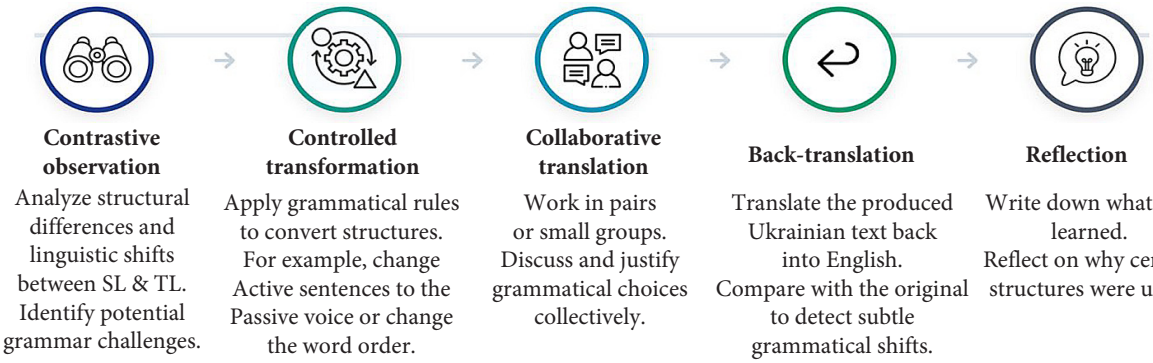

Figure 1. A sequence of translation tasks during the instructional phase
Source: developed by the authors

Following the intervention, students completed a parallel post-test comparable in structure, difficulty, and assessment criteria. The qualitative component included classroom observation, students' reflective journals, and

short semi-structured feedback questionnaires. These instruments were used to explore learners' metalinguistic awareness, reasoning behind grammatical choices, and perceived usefulness of translation tasks. The collected quantitative data were analysed through descriptive statistical comparison of mean scores and percentage gains, while qualitative responses were subjected to thematic analysis to identify recurring patterns in students' reflections.

RESULTS

The empirical findings of the study indicate that the systematic use of translation-based activities had a positive effect on students' grammatical awareness and accuracy in EFL grammar use. The comparison of pre-test and post-test results in Table 1 demonstrates a measurable improvement in learners' ability to recognise and apply grammatical transformations.

Table 1. Students' performance before and after the intervention

Assessed skill	Pre-test (%)	Post-test (%)	Improvement
Word order transformations	58	83	+ 25
Passive-active shifts	54	81	+28
Tense and aspect transformations	61	84	+23
Article-related transformations	49	76	+26
Nominal-verbal restructuring	56	82	+25
Additions and omissions	52	79	+27
Average score	**55**	**81**	**+25**

Source: compiled by the authors

As shown in Table 1, the average performance increased from 55% to 81%, which suggests that translation-based instruction contributed substantially to the development of grammatical competence. Particularly significant progress was observed in passive-active shifts (+28%) and article-related transformations (+26%), which traditionally present considerable difficulty for Ukrainian-speaking EFL learners due to structural differences between English and Ukrainian. This difficulty is illustrated by sentence pairs such as "Did you see a motorcycle in his backyard? The motorcycle has been reported stolen". Here, English obligatorily marks both the first, indefinite mention ("a motorcycle") and the subsequent, definite reference ("the motorcycle"). In contrast, Ukrainian lacks a grammaticalised article system. It renders the first mention without any marker – "Бачив мотоцикл у його дворі?" (Bachyv mototsykl u yoho dvori?; Did you see the motorcycle in his yard?) – and signals the subsequent definite reference using the contextually driven demonstrative pronoun "цей" (tsey; this): "Цей мотоцикл перебуває в розшуку як викрадений" (Tsei mototsykl perebuvaie v rozshuku yak vykradenyi; This motorcycle has been reported stolen and is listed as stolen). A similar structural asymmetry occurs with the passive voice, particularly when dealing with stative forms that do correspond between languages: "You were pretty involved in your book", which required students to recognise that the English stative passive construction does not translate directly into Ukrainian, but is instead rendered through a reflexive perfective verb – "Ти неабияк захопився тією книгою" (Ty neabiiak zakhopyvsia tiieiu knyhoiu). Rather than a literal passive calque, the Ukrainian sentence restructures the predicate entirely, shifting from a stative construction to an active, reflexive one.

The category of additions and omissions demonstrated a substantial increase of +27%. This category directly evaluated the students' capacity to insert obligatory function words in English (such as auxiliary verbs, formal subjects "it", "there", etc.) and omit redundant structures influenced by Ukrainian synthetic syntax. The pre-test errors revealed a negative transfer between L1 and L2, whereas the post-test results showed that translation exercises successfully trained students to manage asymmetric structures. This asymmetry is well illustrated by pairs such as "There was a notebook on the armchair" – "На кріслі лежав записник" (Na krisli lezhav zapysnyk), where the structural divergence between the two languages becomes explicitly apparent. In the English sentence, the existential construction requires the formal, non-referential subject "there" alongside the past tense of the verb "to be", creating an obligatory analytical framework to introduce new information. Conversely, Ukrainian, being a highly synthetic language with flexible word order, functions without formal subjects or empty fillers. Instead, it relies on inversion and the semantic introduction of a descriptive verb like "лежав" (lezhav) to naturalise the setting, shifting the actual subject to the end of the clause for rheme emphasis. The same structural principle can be observed in interrogative constructions. In the sentence pair "Aren't there any guards to protect him?" – "Невже немає охоронців, які б його захистили?" (Nevzhe nemaie okhorontsiv, yaki b yoho zakhystyly?), English again requires the formal subject there, whereas Ukrainian expresses the same meaning without an equivalent grammatical element.

A similarly notable improvement was recorded in word order transformations, where students'performance rose from 58% to 83% (improvement +25%). This increase may be explained by the fact that translation tasks encouraged learners to become more sensitive to the rigid syntactic patterns of English, especially the fixed Subject-Verb-Object order, in contrast to the relatively flexible word order typical of Ukrainian. Through repeated comparison of source and target sentence structures, students appear to have developed a stronger awareness of how meaning and emphasis are shaped by syntactic positioning in English.

This flexibility was demonstrated in class through parallel Ukrainian renderings of the same source sentence, "We are here today to...", which can be naturally translated as "Ми сьогодні зібралися, щоб..." (My sohodni zibralysia, shchob...), "Сьогодні ми зібралися, щоб..." (Sohodni my zibralysia, shchob...), or "Ми зібралися сьогодні, щоб..." (My zibralysia sohodni, shchob...), depending on which element the speaker wishes to emphasise – a freedom of positioning that English word order does not permit.

Substantial gains were also identified in tense and aspect transformations, which improved from 61% to 84% (+23%). Although this category showed the smallest numerical increase among the assessed skills, the results remain pedagogically significant. The relatively high pre-test score suggests that learners possessed some prior knowledge of English tense forms; however, the post-test results indicate that translation-based practice helped refine their understanding of more complex aspectual distinctions, such as the contrast between simple, continuous, and perfect forms. This is especially important for Ukrainian-speaking learners, whose native language expresses temporal relations differently and often lacks direct grammatical equivalents for certain English aspect forms, as in "I've been to Thailand three times now", where the English Present Perfect's experiential aspect has no formal Ukrainian counterpart and must instead be conveyed through a past-tense imperfective verb reinforced by lexical markers: "Я вже тричі бував у Таїланді" (Ya vzhe trychi buvav u Tailandi).

In addition, nominal-verbal restructuring demonstrated a marked improvement from 56% to 82% (+25%). This finding suggests that students became more proficient in transforming noun-based constructions into verb-based ones, and vice versa, depending on the grammatical and stylistic requirements of the target language. Such restructuring is essential in translation, as English often favors more nominalised and static sentence patterns, whereas Ukrainian naturally leans toward verbal structures. The progress in this area indicates that learners were increasingly able to move beyond literal translation and make more natural, target-language-oriented grammatical choices. This was practiced through sentences involving nominalisation, such as "He's a quick decision-maker", which naturally becomes "Він швидко приймає рішення" (Vin shvydko pryimaie rishennia), replacing a nominal predicate with a verbal one. Or "It's more of an environmental thing", which permits two equally natural Ukrainian renderings – a nominal one, "Це радше питання екології" (Tse radshe pytannia ekolohii) and a verbal one, "Це радше пов'язано з екологією" (Tse radshe poviazano z ekolohiieiu), requiring students to weigh competing target-language options rather than apply a single mechanical rule.

To explore the qualitative aspects of students' learning, their written responses and reflections in semi-structured questionnaires and reflective journals were analysed by identifying recurring themes. This analysis revealed three primary themes: cognitive noticing and mapping; error decoupling; collaborative validation. In relation to the semi-structured questionnaires, 87.5% of the participants (21 students) explicitly stated that the back-translation technique was the most effective instrument for revealing hidden grammar gaps. Students noted that translating from English to Ukrainian and then back to English forced them to objectively evaluate whether their grammar structures matched the exact target language criteria.

Classroom observation further revealed that students gradually moved from literal translation strategies toward more conscious structural reformulation. An important finding concerned the development of metalinguistic awareness. Students' reflective journals frequently included comments which were structurally categorised during thematic analysis: "Translation helped me understand why English needs another structure, especially when dealing with words that don't exist in Ukrainian, such as articles", (Theme 1: Cognitive noticing) "I started noticing grammar patterns instead of translating word by word, and the back-translation exercises showed me exactly where my structural choices failed". (Theme 2: Error decoupling). "Working with my partner helped me notice grammatical differences that I had completely missed on my own. Explaining our choices made us think more carefully about which structure sounded more natural". (Theme 3: Collaborative validation)

The thematic analysis confirmed that back-translation served as an error-correcting mirror, rendering abstract grammatical concepts tangible. Consequently, these findings indicated that translation tasks fostered not only mechanical accuracy but also deeper cognitive processing. The analysis conducted in this study demonstrated that translation activities can contribute significantly to developing learners' awareness of grammatical transformations. To address this need, the proposed pedagogical model integrated structured translation exercises with reflective linguistic analysis. Before exploring the discussion parameters, the final multi-stage framework developed from this intervention is illustrated below in Figure 2. The model was designed around four interrelated stages: contrastive analysis; collaborative translation tasks; transformational exercises; metalinguistic reflection. At the initial stage, students engaged in contrastive analysis by translating selected sentences and identifying syntactic, morphological, and semantic shifts. The collaborative translation phase encouraged peer interaction, where learners negotiated the meaning, discussed alternative renderings, and justified grammatical choices. The third stage focused on transformational exercises, where learners applied specific grammatical transformations, such as active-passive shifts, direct-indirect speech changes, and nominal-verbal restructuring. Finally, the metalinguistic reflection prompted students to examine the grammar principles underlying these transformations. By combining practice, collaboration, and reflection, the suggested model promoted the internalisation of complex grammatical phenomena.

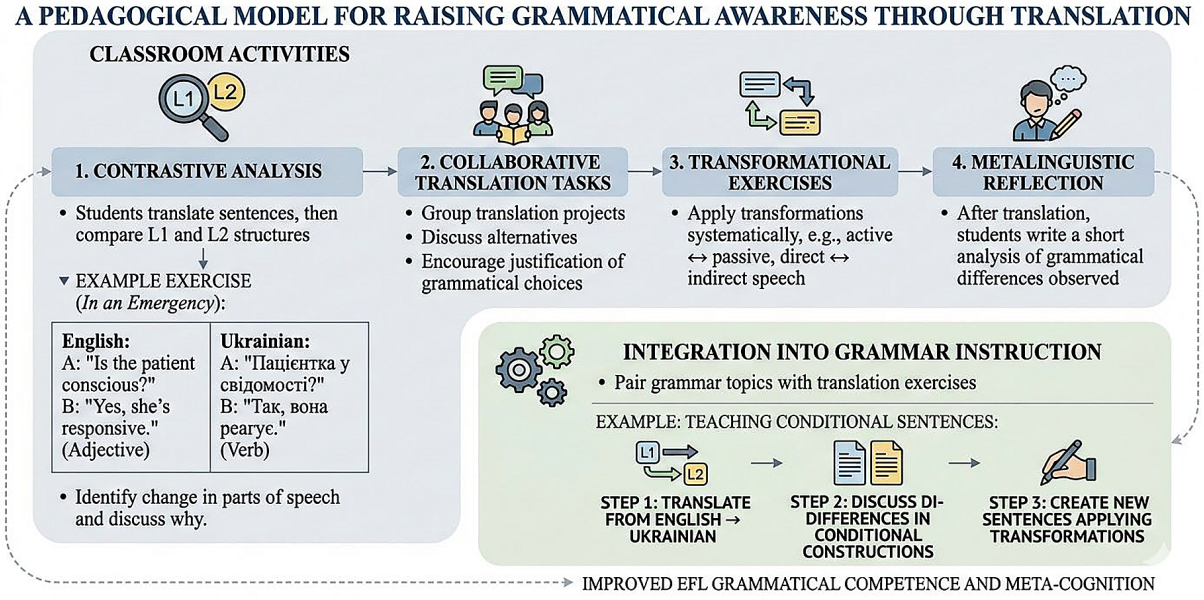

Figure 2. A pedagogical model for raising grammatical awareness through translation in the EFL classroom
Source: developed by the authors

DISCUSSION

The empirical findings obtained in this study indicate that integrating pedagogical translation into the communicative EFL classroom yields a positive effect on structural accuracy and metalinguistic processing. In order to contextualise these findings within the global landscape of contemporary language pedagogy, it is necessary to contrast current results with recent empirical literature published within the last five years. This comparison allowed to establish the validity of current methodological choice and identify the contributions of intervention targeting Ukrainian-speaking learners.

The overall gain in accuracy observed in this study (from 55% to 81%) is in line with the findings of H. Soleimani & H. Heidarikia (2017). In their quasi-experimental study, an experimental group that used translation as a noticing strategy showed a statistically significant improvement in handling complex grammatical structures, while a control group without this treatment did not improve to the same extent. Their design did not treat translation as the final goal, but as a way of exposing gaps in learners' interlanguage. This aligns with Schmidt's Noticing Hypothesis (Leow, 2019), which this study also used to explain how translation helped students move from intuitive transfer toward conscious grammatical choice.

Back-translation was students' preferred diagnostic tool in this study: 87.5% of participants named it the most effective way to reveal hidden grammar gaps. This finding parallels D. Wang & D. Wang (2026) four-stage Chinese-English translation task, where comparing one's own output against a model translation proved decisive for revision quality. Authors found that when learners "accepted with a reason" the differences between their output and the model, their revisions improved much more often than when they simply noticed a difference without explaining it. This pattern is very close to the current thematic findings. Students' journal entries described back-translation as a way to understand why their structural choices failed, not just that they were wrong. This matches researchers' "reasoned acceptance" pattern, which they identify as the stronger predictor of improvement.

This convergence points to a deeper explanation for why reasoning through a grammatical choice, rather than simply spotting it, drives learning. As O. Kapranov (2023) argues, metalinguistic awareness is a key cognitive resource in language learning: it allows learners to reflect on, analyse, and manipulate linguistic structures rather than process language implicitly. Seen in this light, "reasoned acceptance" is not just a more effective revision strategy. It is a visible sign of metalinguistic awareness in action, as learners consciously articulate why one structure is preferable to another. Together, these findings suggest that the value of back-translation lies less in the act of comparison itself, and more in the explanatory reasoning it provokes. This is a useful detail to build into future versions of the pedagogical model proposed here.

The gains in language awareness found in thematic analysis are further supported by E.T. Murtisari (2020) action research. In her study, translation was integrated into isolated grammar teaching for tertiary EFL learners working on the simple past-present perfect distinction. Author found that translation exercises helped students recognise L1-L2 differences, understand the semantic nuances of specific grammatical forms, and see grammar as a tool for meaning-making rather than a set of mechanical rules. These outcomes closely echo current study's participants' reflections on why English requires structures that Ukrainian does not encode, such as articles. These findings

also align with earlier evidence from E. Çalış & K. Dikilitaş (2012), who found that even elementary-level Turkish EFL learners rated translation-based grammar practice highly for helping them notice structural patterns and compare their first language with English. That translation supports grammatical noticing even for beginners, and not only for the B2-level learners studied here, suggests its pedagogical value may hold across a wide range of proficiency levels, though the nature of what gets noticed likely differs with learner sophistication. E.T. Murtisari also found that translation exercises "allowed deeper learning" of specific grammatical items than presentation-and-practice instruction alone. This offers a plausible explanation for why participants showed particularly strong gains in article-related transformations and passive-active shifts. These are exactly the categories where surface-level rule instruction is not enough on its own, and where the comparative, meaning-focused nature of translation seems to add the most value.

Notably, these positive learner responses to translation-based grammar work are not limited to university-level or Ukrainian-speaking learners. P. Scheffler (2013) found that Polish secondary school students rated a grammar-translation task targeting tense and aspect contrasts as equally useful and engaging as a comparable communicative consciousness-raising activity, with no statistically significant difference between the two. Author's participants described the exercise as helping them see "how English people think" – a formulation that closely resembles this study's participants' reflections on why English requires structures that Ukrainian does not encode. Taken together with the present findings, this suggests that translation-based grammar tasks can be perceived as motivating and worthwhile across different educational levels and language pairs, provided the L1-L2 contrasts they highlight are genuinely difficult for learners.

Positioned within this broader empirical picture, current findings ultimately support a wider theoretical shift in how translation is understood in language pedagogy, led by G. Cook (2010) and L. Pintado Gutiérrez (2018). They argue that translation works as a structured instructional tool, not as a leftover practice from the grammar-translation method. Current findings support this view empirically for the still underexplored Ukrainian-English language pair, extending a body of evidence previously grounded mainly in Spanish-English, Chinese-English, and Polish-English contexts.

CONCLUSIONS

This study was designed to examine the pedagogical potential of translation activities for raising grammatical awareness in the EFL classroom and to propose a model for integrating such activities into practical grammar instruction. Both aims were achieved. The six-week intervention produced a substantial increase in learners' grammatical accuracy, from an average of 55% to 81%, with the largest gains observed in passive-active shifts, additions and omissions, and article-related transformations, precisely the categories where structural asymmetry between Ukrainian and English is greatest, and where surface-level rule instruction alone is least effective. Qualitative evidence from students' reflective journals and questionnaires converged with these quantitative results: back-translation, in particular, emerged as the technique students found most valuable for uncovering hidden gaps in their interlanguage, consistent with the broader pattern identified in comparable studies that reasoned engagement with L1-L2 contrasts, rather than passive exposure, drives grammatical noticing and its uptake into revised production.

Building on these findings, the study makes two main contributions. First, it offers empirical evidence (still comparatively rare) that structured, task-based translation can measurably improve grammatical competence specifically within the underexplored Ukrainian-English language pair, extending a body of research previously concentrated on Spanish-English, Chinese-English, and Polish-English contexts. Second, it proposes and empirically tests a four-stage pedagogical model – contrastive analysis, collaborative translation, transformational exercises, and metalinguistic reflection – that turns the theoretical case for pedagogical translation into a concrete, replicable classroom sequence. The model may be integrated into university-level EFL grammar courses, particularly in contexts where learners' first language differs substantially from English in syntax and morphology, and it requires no specialised technology or resources beyond what is already available in a standard grammar course. Several limitations should nonetheless be acknowledged. The sample size (n = 24) was relatively small and drawn from a single institution, and the absence of a control group means the observed gains cannot be fully isolated from other factors, such as general course progression or increased exposure to English over the six-week period. The reliance on self-reported reflective data also means that students' accounts of their own learning process, while valuable, cannot be independently verified. Furthermore, findings on delayed noticing suggests, the post-test was administered immediately after the intervention, so the durability of these gains beyond the six-week period remains untested. Future research should employ larger randomised samples, delayed post-testing, and multi-institutional designs to validate the findings and examine the effectiveness of technology-assisted translation, including machine translation and back-translation, in grammar instruction.

ACKNOWLEDGEMENTS

None.

FUNDING

None.

CONFLICT OF INTEREST

None.

REFERENCES

[1] Asquerino Egoscozábal, L., & Estrada Chichón, J.L. (2023). Pedagogical translation in foreign language teaching: A systematic review of scientific articles published in the last five years. *Didáctica. Lengua y Literatura*, 36, 89-100. doi: 10.5209/dill.85612.
[2] Bader, M., Halverson, S.L., & Möller-Omrani, C. (2026). Metalinguistic awareness in the EFL classroom and beyond: Exploring the potential of translation tasks. *TESOL Journal*. doi: 10.1002/tesq.70146.
[3] Belhadia, A. (2024). Practical guidelines for implementing translation into the EFL classroom. *Journal of Languages and Translation*, 4(2), 218-228.
[4] British Educational Research Association. (2024). *Ethical guidelines for educational research* (5th ed.). London: BERA.
[5] Çalış, E., & Dikilitaş, K. (2012). The use of translation in EFL classes as L2 learning practice. *Procedia – Social and Behavioral Sciences*, 46, 5079-5084. doi: 10.1016/j.sbspro.2012.06.389
[6] Cook, G. (2010). *Translation in language teaching: An argument for reassessment*. Oxford: Oxford University Press.
[7] Huang, X. (2022). *Teachers' implementation of translanguaging in EFL classrooms: A systematic review*. (Master's dissertation, University of Oxford, Oxford, United Kingdom).
[8] Kapranov, O. (2023). Topics in foreign language teaching in research articles in psycholinguistics: Reviewing the state-of-the-art. *Verbum*, 14. doi: 10.15388/verb.39.
[9] Kordia, S. (2020). ELF awareness in the task-based classroom: A way forward. *ELT Journal*, 74(4), 398-407. doi: 10.1093/elt/ccaa034.
[10] Korunets, I.V. (2003). *Theory and practice of translation*. Vinnytsia: Nova Knyha.
[11] Leow, R.P. (2019). Noticing hypothesis. In *The TESOL encyclopedia of English language teaching*. Hoboken: John Wiley & Sons. doi: 10.1002/9781118784235.eelt0086.pub2.
[12] Murtisari, E.T. (2020). Enhancing isolated grammar teaching through translation: Sentence level and beyond. *LLT Journal: A Journal on Language and Language Teaching*, 23(1), 157-170. doi: 10.24071/llt.v23i1.2416.
[13] Orland-Barak, L., & Fuchs, C. (2023). Noticing and metalinguistic awareness in the L2 writing process: A translation-based writing task for L1 Arabic speakers preparing to teach Hebrew as a second language. *Journal of Second Language Writing*, 62, article number 101065. doi: 10.1016/j.jslw.2023.101065.
[14] Ping, Y. (2026). Revisiting translation as a method in language teaching and learning. *ELT Journal*, 80(1), 174-179. doi: 10.1093/elt/ccae022.
[15] Pintado Gutiérrez, L. (2018). Translation in language teaching, pedagogical translation, and code-switching: Restructuring the boundaries. *The Language Learning Journal*, 49(2), 219-239. doi: 10.1080/09571736.2018.1534260.
[16] Rossi, C., Hong, W., Daniel, S., & Fernández-Parra, M. (2021). Rehabilitating translation in the language classroom: A proposal based on conceptual metaphors to foster machine translation literacy. *Bulletin Suisse de Linguistique Appliquée*, 114, 67-88.
[17] Scheffler, P. (2013). Learners' perceptions of grammar-translation as consciousness raising. *Language Awareness*, 22(3), 255-269. doi: 10.1080/09658416.2012.703673.
[18] Sifakis, N. (2023). Metacognitive and metalinguistic activities can raise ELF awareness: Why and how. *Journal of English as a Lingua Franca*, 12(1), 43-66. doi: 10.1515/jelf-2023-2006.
[19] Soleimani, H., & Heidarikia, H. (2017). The effect of translation as a noticing strategy on learning complex grammatical structures by EFL learners. *Applied Linguistics Research Journal*, 1(1), 1-13. doi: 10.14744/alrj.2017.09797.
[20] Wang, D., & Wang, H. (2026). Exploring the effects of the noticing function of output on second language learning in a four-stage Chinese-English translation task. *Asian-Pacific Journal of Second and Foreign Language Education*, 11, article number 7. doi: 10.1186/s40862-025-00372-7.

Марина Зембицька
Кандидат педагогічних наук, доцент
Хмельницький національний університет
29016, вул. Інститутська, 11, м. Хмельницький, Україна
https://orcid.org/0000-0002-6671-9937
Андрій Горошко
Доктор технічних наук, професор
Хмельницький національний університет
29016, вул. Інститутська, 11, м. Хмельницький, Україна
https://orcid.org/0000-0002-1386-2326

Розвиток граматичної усвідомленості засобами перекладу в навчанні англійської мови як іноземної

Анотація. Розвиток граматичної компетенції студентів залишається ключовим завданням у викладанні англійської як іноземної мови, особливо в умовах значних структурних розбіжностей між українською та англійською мовами. Ефективне подолання міжмовної інтерференції потребує впровадження нових когнітивно орієнтованих методичних підходів. Метою цієї статті було дослідження педагогічного потенціалу вправ на переклад у контексті підвищення рівня металінгвістичної обізнаності та розвитку граматичної компетенції майбутніх філологів. Для досягнення мети було застосовано квазіекспериментальний змішаний метод дослідження за участю 24 студентів (першого та другого курсів) Хмельницького національного університету, який поєднував до- та післяекспериментальне тестування з аналізом рефлексивних щоденників. Навчальна модель інтегрувала елементи контрастивного аналізу, колективного та зворотного перекладу в межах завданнєвої педагогіки. Проаналізовано особливості типових граматичних трансформацій на рівні зміни станів дієслова, порядку слів, номінально-дієслівної реструктуризації, додавання/опущення елементів та вживання артиклевих структур. Встановлено, що систематичне використання цільових перекладацьких завдань сприяє суттєвому покращенню показників точності мовлення студентів, підвищивши середній бал тестування з 55 % до 81 %. Доведено, що вправи на основі перекладу стимулюють глибоке когнітивне опрацювання матеріалу та активізують гіпотезу помічання в засвоєнні другої мови. Розроблено та теоретично обґрунтовано чотириетапну педагогічну модель інтеграції перекладацьких вправ у процес навчання практичної граматики. З'ясовано, що запропоновані завдання ефективно трансформують інтуїтивне внутрішнє перекладання студентів на свідому аналітичну мовну обізнаність. Результати дослідження можуть бути безпосередньо використані викладачами вищих навчальних закладів та методистами для модернізації навчальних програм з практичної граматики англійської мови

Ключові слова: педагогічний переклад; граматичні трансформації; металінгвістична свідомість; методика навчання; аудиторне дослідження

UDC 159.944.4:159.972
DOI: 10.52534/msu-pp2.2026.84

ISSN 2413-3329
E-ISSN 2520-6788

Mariia Tiuhanova*
Assistant
State University of Economics and Technologies
50005, 16 Medychna Str., Kryvyi Rih, Ukraine
https://orcid.org/0009-0007-5016-1688

Yuliia Maier
PhD in Psychology, Associate Professor
Mykolaiv National Agrarian University
54020, 9 Hryhoriia Honhadze Str., Mykolaiv, Ukraine
https://orcid.org/0000-0002-9472-643X

Alina Barkhota
Student
State University of Economics and Technologies
50005, 16 Medychna Str., Kryvyi Rih, Ukraine
https://orcid.org/0000-0002-7857-3613

Psychological characteristics of the relationship between anxiety and emotional burnout

Article's History:
Received: 08.12.2025
Revised: 13.04.2026
Accepted: 25.05.2026
Published: 29.06.2026

Suggested Citation:
Tiuhanova, M., Maier, Yu., & Barkhota, A. (2026). Psychological characteristics of the relationship between anxiety and emotional burnout. *Scientific Bulletin of Mukachevo State University. Series "Pedagogy and Psychology"*, 12(2), 84-91. doi: 10.52534/msu-pp2.2026.84.

*Corresponding author
(maria.tyuganova.51@gmail.com)

Abstract. The article presents the results of an empirical study devoted to investigating the relationship between anxiety levels and susceptibility to emotional burnout among young adults aged 20-36. The aim of the research was to explore how anxiety is related to emotional burnout and its manifestations in young adults. The study involved 134 participants and was conducted online, which ensured coverage of various social and professional contexts and preserved the anonymity of respondents. Anxiety was assessed using the Spielberger Anxiety Scale, and emotional burnout was assessed using the Maslach Methodology, which includes components of emotional exhaustion, depersonalisation, and reduced personal accomplishment. The results showed that younger participants aged 20-24 have higher levels of anxiety and more pronounced emotional exhaustion, while depersonalisation and reduced personal accomplishment are less intense. Correlation analysis confirmed a significant positive relationship between anxiety levels and manifestations of emotional exhaustion and depersonalisation, as well as a negative relationship with a sense of personal achievement, indicating the impact of anxiety on the psycho-emotional state and motivation of young adults. The data obtained emphasise the importance of developing preventive and psychological programmes aimed at developing adaptive stress regulation strategies, increasing emotional stability, and forming effective coping strategies in young people. The study provides a scientific basis for further research into the mechanisms of anxiety's impact on emotional burnout, including age, gender, and sociocultural characteristics, as well as for evaluating the effectiveness of psychological interventions aimed at preventing and correcting burnout among young adults

Keywords: psycho-emotional exhaustion; personal effectiveness; psychological resilience; stress factors; emotional regulation

Copyright © The Author(s). This is an open access article distributed under the terms of the Creative Commons Attribution License 4.0 (https://creativecommons.org/licenses/by/4.0/)

INTRODUCTION

Despite a significant number of scientific studies devoted to the problem of emotional burnout and anxiety, the issue of their interconnection remains relevant and requires further in-depth study. Particular attention should be paid to studying the psychological characteristics of this relationship among young people who are in the stage of active personal and professional development. This age period is characterised by intense processes of personal identity formation, professional self-determination, and adaptation to new social roles. The combination of educational, professional, and social activities is often accompanied by increased psycho-emotional stress, which can contribute to the development of anxiety and manifestations of emotional exhaustion. In this regard, the study of psychological factors that determine the development of emotional burnout is important for understanding the mechanisms of maintaining mental well-being.

In particular, R. Bianchi *et al.* (2021) provided an integrative conceptualisation of emotional burnout as a multidimensional syndrome that emerges as a result of prolonged exposure to occupational and psychosocial stressors. The authors emphasised that chronic stress exposure does not merely increase emotional exhaustion but progressively undermines emotional regulation systems, leading to a cumulative depletion of psychological resources. This process is closely associated with heightened anxiety levels, which function both as a precursor and as a reinforcing factor of burnout development. Importantly, their findings indicate that burnout should be understood as a progressive process rather than a static condition, characterised by escalating emotional dysregulation, detachment, and reduced psychological resilience over time.

Z. Hao *et al.* (2021) provided evidence that anxiety plays a significant mediating role in the relationship between environmental stressors and burnout-related outcomes. Their findings demonstrated that increased anxiety levels are associated with higher emotional exhaustion and maladaptive behavioural patterns, including reduced self-regulation capacity. Importantly, the authors emphasised that anxiety not only intensifies perceived stress but also alters cognitive appraisal processes, thereby increasing vulnerability to burnout development. This supports the conceptualisation of anxiety as a central psychological mechanism linking external stress exposure to internal emotional depletion. Further expanding this perspective, S.A. Sevinc *et al.* (2022) investigated anxiety and burnout among healthcare professionals operating under high-intensity working conditions. Their results revealed a strong positive association between anxiety levels and all core dimensions of burnout, particularly emotional exhaustion. The study highlighted that chronic exposure to occupational stressors significantly amplifies anxiety responses, which in turn accelerates psychological fatigue and reduces adaptive functioning. These findings suggest a cyclical relationship in which anxiety and burnout mutually reinforce each other, especially in high-demand environments.

Complementary evidence is provided by H. Zhang *et al.* (2020), who demonstrated that anxiety symptoms are significantly correlated with emotional exhaustion in professional populations. Their study further emphasised the moderating role of social support, indicating that external psychological resources can buffer the negative impact of anxiety on burnout development. This highlights that while anxiety is a strong risk factor, its effects are not deterministic and may be influenced by protective environmental and interpersonal factors. From a cognitive perspective, P. Koutsimani *et al.* (2022) examined the relationship between burnout and cognitive functioning, demonstrating that burnout is associated with impairments in executive control and cognitive flexibility. Importantly, their findings suggest a bidirectional relationship between anxiety and burnout, where cognitive inefficiencies contribute to heightened anxiety, which further exacerbates burnout symptoms. This cognitive-emotional feedback loop provides a more complex understanding of how psychological strain is maintained over time.

Contemporary Ukrainian studies confirm the presence of a significant relationship between anxiety levels and manifestations of emotional burnout among young adults. In particular, higher levels of anxiety are associated with more pronounced emotional exhaustion, reduced stress resilience, and impaired emotional regulation. It is also noted that burnout syndrome is often intensified under conditions of prolonged psycho-emotional load and insufficient adaptive coping strategies. In the study by O.I. Solonyna (2021), social anxiety in students and its relationship with emotional burnout were investigated. The author emphasised that high levels of anxiety serve as a predictor of emotional exhaustion and reduced psychological well-being. The research conducted by S.M. Buzhynska & A.O. Boichenko (2019) demonstrated that anxiety significantly contributes to the development of burnout syndrome among pedagogical students, particularly through reduced emotional stability and difficulties in emotional self-regulation. Thus, an analysis of scientific sources indicates that researchers pay considerable attention to the problem of anxiety and emotional burnout, but the question of the psychological characteristics of their interconnection among young adults requires further empirical study. The aim of the study was to identify the psychological characteristics of the relationship between anxiety levels and manifestations of emotional burnout in young adults.

MATERIALS AND METHODS

An empirical study of the psychological characteristics of the relationship between anxiety and emotional burnout was conducted in 2025 in accordance with the generally accepted principles of psychological research, including objectivity, consistency, scientific validity, and ethical standards as outlined in the American Psychological Association (2017) ethical principles. All participants took part voluntarily, were informed about the purpose of the study,

and were assured of the confidentiality of the data obtained. The use of an online format for collecting information is justified by modern studies confirming its reliability and validity (Wright, 2006; Andrade, 2020). The methodological basis of the study was formed by systemic, person-centred, and integrative approaches, which allowed to consider anxiety and emotional burnout as interrelated psychological phenomena that are formed as a result of the interaction of individual psychological characteristics of a person and the influence of external stress factors. The systemic approach involves analysing psychological phenomena in the context of their interconnection and interdependence. The person-centred approach ensures that the individual psychological characteristics of respondents are taken into account. The integrative approach allows for a comprehensive analysis of the phenomena under study. The study was carried out in three stages: The theoretical stage involved analysing scientific literature to identify the main approaches to studying anxiety and emotional burnout, clarifying the conceptual and categorical apparatus, and justifying the choice of empirical methods (Maslach & Jackson, 1981; Spielberger, 2010; Skapinakis, 2014). Methods of analysis, synthesis, generalisation, systematisation, and comparison of scientific sources were used.

The empirical stage included the formation of a sample and the conduct of a psychodiagnostic study. The sample consisted of 134 participants aged 20 to 36, representing the stage of emerging and active adulthood, which corresponds to the period of early and middle adulthood in the psychosocial development framework proposed by Erikson (Erikson, 1950; McLeod, 2025). According to this theoretical approach, individuals in this age range are engaged in identity consolidation, professional establishment, and the development of long-term interpersonal relationships. The sample was formed on a voluntary and accessible basis, and the study was conducted online. Inclusion criteria: voluntary consent to participate, compliance with the age range, and complete completion of psychodiagnostic methods. The sample represents a group of young people with increased psycho-emotional stress and a potential tendency to develop emotional burnout (Salvagioni *et al.*, 2017; Zhang *et al.*, 2020).

Standardised psychodiagnostic instruments with high validity and reliability were used to assess anxiety levels and emotional burnout in the participants. The level of anxiety was assessed using the Spielberger-Hanin State-Trait Anxiety Inventory (STAI), which allows for the evaluation of both situational (state) and dispositional (trait) anxiety. The use of this instrument is supported by extensive research confirming its reliability and validity across different age and occupational groups (Julian, 2011). For the STAI, total scores range from 20 to 80 points. Scores of 20-39 are interpreted as low anxiety, 40-59 as moderate anxiety, and 60-80 as high anxiety (Spielberger, 2010). This classification enabled a clear quantitative differentiation of anxiety levels within the sample. Emotional burnout was assessed using the Maslach Burnout Inventory (MBI), which includes three subscales: Emotional Exhaustion (EE), Depersonalisation (DP), and Personal Accomplishment (PA). According to normative guidelines, higher scores on EE and DP indicate higher levels of burnout, while lower scores on PA reflect reduced personal accomplishment. For EE, scores of 0-16 are considered low, 17-26 moderate, and 27 or above high. For DP, 0-6 indicates low, 7-12 moderate, and 13 or above high burnout. For PA, 39 or above indicates high personal accomplishment, 32-38 moderate, and 0-31 low (Maslach & Jackson, 1981).

The use of these standardised thresholds ensured transparency in classification and increased the interpretability and comparability of the obtained results. Emotional burnout was assessed using the MBI methodology, which provides a comprehensive diagnosis of three interrelated components of this phenomenon. The first component, emotional exhaustion, is characterised by psycho-emotional fatigue, decreased energy, and reduced ability to effectively perform professional and social duties. The second component, depersonalisation, manifests itself through alienation in interpersonal relationships, cynicism, and emotional distancing, reflecting the psychological defense of the individual against excessive emotional stress. The third component – reduced personal accomplishment – includes a subjective feeling of reduced effectiveness, motivation, and competence, which can negatively affect an individual's professional and social functioning (Koutsimani *et al.*, 2022).

The integration of these components in the study allowed emotional burnout to be considered as a multidimensional phenomenon associated with individual psychological characteristics and anxiety levels. The combination of the STAI scale and the MBI methodology provided a comprehensive assessment of respondents' psycho-emotional state, capturing both stable personality-related tendencies and current emotional experiences. This approach increased the reliability and validity of the obtained data. STAI includes statements that assess both situational and trait anxiety, such as "I feel calm", "I feel nervous", or "I am tense", where respondents indicate the degree to which each statement reflects their current or general emotional state. The MBI includes items reflecting different dimensions of burnout: emotional exhaustion (e.g., "I feel emotionally drained from my work"), depersonalisation (e.g., "I feel I treat some people as if they were impersonal objects"), and personal accomplishment (e.g., "I feel I am positively influencing other people's lives through my work"). These standardised items allow for a structured assessment of emotional exhaustion, interpersonal distancing, and perceived professional effectiveness.

Together, these instruments enable the simultaneous assessment of anxiety as both a stable trait and a situational state, as well as the key components of emotional burnout, ensuring a more comprehensive and methodologically robust analysis of respondents' psychological functioning. The procedure included providing respondents with clear instructions on how to complete electronic questionnaires

containing socio-demographic questions and psychodiagnostic methods. The average completion time was 20-25 minutes, which minimised fatigue and ensured the reliability of responses. The online format ensured standardisation of data collection conditions and made participation accessible to a wide range of respondents (Wright, 2006). The analytical stage involved quantitative processing of the results. Descriptive statistics (mean values, standard deviations) and Pearson's correlation analysis were used to assess the strength and direction of the relationship between anxiety and components of emotional burnout (Field, 2020). Statistical processing was performed using Jamovi and Microsoft Excel, which ensures the accuracy of calculations, reliability of results, and their reproducibility. The use of these methodological approaches, theoretical and empirical methods, as well as mathematical and statistical procedures, made it possible to obtain objective, valid, and reliable data on the psychological characteristics of the relationship between anxiety and emotional burnout among young adults.

RESULTS AND DISCUSSION

The sample consisted of 134 participants aged 20 to 36. The distribution of the sample by age groups is shown in Table 1.

Table 1. Distribution of the sample by age

Age group (years)	Quantity	Percentage
20-24	38	28.4
25-29	45	33.6
30-36	51	38
Total	134	100

Source: developed by the authors

An analysis of age groups shows that participants aged 30-36 account for the largest share (38%). Younger respondents (aged 20-24) showed a tendency toward higher average levels of anxiety and emotional burnout compared to older respondents, which is consistent with international studies indicating increased psycho-emotional sensitivity among young people in the early stages of professional and personal development (Salvagioni *et al.*, 2017; Bianchi *et al.*, 2021). The average anxiety level in the sample on the STAI scale was 42.7 points (SD = 10.8), which corresponds to a moderate level of anxiety. The distribution of anxiety by age group shows a decrease in the average level with age: younger participants (20-24 years) had an average score of 45.2 points, while older participants (30-36 years) had an average score of 41.0 points (Table 2).High anxiety levels were observed in 29.1% of participants, moderate levels in 47.8%, and low levels in 23.1%. The most vulnerable group was young adults aged 20-24, among whom 36.9% demonstrated high anxiety levels. These findings are consistent with the data of H. Zhang *et al.* (2020) and R. Bianchi *et al.* (2021), who showed that the early stages of professional development are accompanied by increased psycho-emotional sensitivity. Emotional burnout was assessed using the MBI methodology, which includes three components: EE refers to a state of psycho-emotional exhaustion, fatigue, and reduced ability to perform professional duties effectively. DP is characterised by alienation in interpersonal relationships and emotional distancing (Koutsimani *et al.*, 2022). PA reflects an individual's sense of professional competence, effectiveness, and achievement. Lower scores on this scale indicate reduced self-efficacy and perceived professional competence (Bianchi *et al.*, 2021). The distribution of emotional burnout levels by age group is shown in Table 3.

Table 2. Anxiety test (STAI) results among participants, n = 134

Age group (years)	Mean STAI score (M)	Standard deviation (SD)	Low level (%)	Moderate level (%)	High level (%)
20-24	45.2	11.1	18.4	44.7	36.9
25-29	42.1	10.3	24.4	48.9	26.7
30-36	41.0	10.0	27.5	49.0	23.5
Total	42.7	10.8	23.1	47.8	29.1

Source: developed by the authors

Table 3. Distribution of emotional burnout levels among participants (n = 134) by age group, %

Age group (years)	EE: low	EE: moderate	EE: high	DP: low	DP: moderate	DP: high	PA: low	PA: moderate	PA: high
20-24	12.6	50.0	37.4	35.8	50.0	14.2	15.8	60.5	23.7
25-29	18.9	55.6	25.5	42.2	48.9	8.9	20.0	62.2	17.8
30-36	22.5	57.5	20.0	48.0	44.0	8.0	25.0	60.0	15.0
Total	17.7	54.5	27.8	42.7	47.7	9.6	20.9	61.2	17.9

Source: developed by the authors

A moderate level of EE is observed in most respondents (54.5%), while high EE is characteristic of 27.8%, mainly among younger participants aged 20-24 (37.4%). A high level of DP is observed in 9.6% of the sample, while

low and moderate levels are observed in most respondents. PA is predominantly at a moderate level (61.2%), with a low level observed in 20.9% of participants, mainly younger ones. Pearson's correlation analysis (r) was used to assess the relationship between anxiety levels and emotional burnout. The results are presented in Table 4.

Table 4. Correlation between anxiety levels (STAI) and components of emotional burnout (n = 134)

Indicator	EE (r)	DP (r)	PA (r)
STAI	0.58**	0.41**	-0.36**

Note: **p < 0.01
Source: developed by the authors

In the present study, the PA scale was interpreted as Personal Accomplishment, where higher scores indicate a stronger sense of professional competence and achievement, whereas lower scores reflect reduced personal accomplishment. Therefore, the negative correlation between anxiety and PA ($r = -0.36$, $p < 0.01$) suggests that higher anxiety levels are associated with a lower sense of personal effectiveness and achievement. The results indicated that correlation analysis revealed a statistically significant positive relationship between anxiety and EE ($r = 0.58$, $p < 0.01$), indicating that higher levels of anxiety are associated with increased emotional exhaustion. A moderate positive correlation was also found between anxiety and DP ($r = 0.41$, $p < 0.01$), suggesting that elevated anxiety contributes to emotional distancing and negative attitudes toward others. At the same time, a statistically significant negative correlation was identified between anxiety and PA ($r = -0.36$, $p < 0.01$), which demonstrates that higher anxiety levels are associated with a reduced sense of professional competence and personal accomplishment.

The correlation coefficients obtained indicate a positive significant relationship between anxiety and two components of emotional burnout (EE and DP), suggesting that increased anxiety is associated with increased emotional exhaustion and alienation in interpersonal interactions. At the same time, the negative relationship between anxiety and PA indicates a decrease in self-efficacy and motivation in respondents with high levels of anxiety. These results are consistent with the findings of S.L.D. Restubog *et al.* (2020), who noted that anxiety is a predictor of reduced personal achievement and increased depersonalisation in young workers. Similar conclusions were obtained in a study by H. Zhang *et al.* (2020), which showed that anxiety correlates with EE in students and young professionals, as well as in the works of M.P. Leiter (2021), who emphasised that high levels of anxiety are associated with the development of emotional exhaustion in the early stages of professional activity.

The theoretical foundations of the relationship between anxiety and emotional burnout are based on the transactional model of stress proposed by S. Folkman & J.T. Moskowitz (2004). Within this framework, stress is understood as a result of the interaction between the individual and the environment, while coping strategies serve as a key regulatory mechanism. The authors emphasised that coping effectiveness determines psychological well-being and the ability to withstand chronic stress, which is directly related to the risk of emotional burnout development. Contemporary research conceptualises anxiety as a central individual psychological factor in the development and maintenance of emotional burnout. Unlike situational stress responses, anxiety is increasingly understood as a relatively stable personality-related disposition that shapes the way individuals perceive, interpret, and respond to stressors in everyday life and professional contexts.

In particular, D.A.J. Salvagioni *et al.* (2017) defined anxiety as a relatively stable psychological trait reflecting an individual's tendency toward heightened tension, anticipatory worry, and increased sensitivity to environmental stressors. This conceptualisation is important because it positions anxiety not merely as an emotional reaction to external events, but as a persistent vulnerability factor that influences long-term psychological functioning. Individuals with elevated anxiety levels are more likely to perceive neutral or ambiguous situations as threatening, which increases their overall stress load and contributes to chronic psycho-emotional strain. Building on this, K.A. Knowles *et al.* (2018) emphasised the cognitive-emotional mechanisms underlying the anxiety-burnout relationship. The authors found that high levels of anxiety are associated with impairments in emotional regulation processes, including reduced ability to reappraise negative experiences and decreased flexibility in coping responses. Additionally, anxious individuals demonstrate increased attentional bias toward negative stimuli and a tendency toward maladaptive cognitive appraisal of situations. These mechanisms collectively contribute to sustained emotional overload, which gradually exhausts psychological resources and increases vulnerability to burnout symptoms.

Further empirical support is provided by J. Zhou *et al.* (2016), who demonstrated that elevated anxiety is significantly associated with higher levels of emotional exhaustion and reduced psychological resilience. Their findings indicate that anxiety not only intensifies the emotional component of stress responses but also weakens adaptive capacity, thereby limiting an individual's ability to recover from prolonged exposure to stressors. This combination of heightened emotional reactivity and diminished resilience creates a psychological profile that is particularly susceptible to the development of emotional burnout. Data interpretation revealed several key trends. First, younger participants (aged 20-24) showed the highest levels of anxiety and emotional exhaustion, especially EE and DP. This finding indicates increased vulnerability among young people in the early stages of social and professional adaptation.

The results confirm the conclusions of D.A.J. Salvagioni *et al.* (2017) and R. Bianchi *et al.* (2021) who noted that young adults are in a state of heightened psycho-emotional sensitivity and susceptibility to stress reactions due to insufficiently developed self-regulation mechanisms. Second, older participants (aged 30-36) demonstrated lower levels of anxiety and emotional burnout, indicating a gradual accumulation of adaptive resources, experience in coping with stress, and the formation of effective strategies for regulating their psycho-emotional state. This conclusion is consistent with the work of P. Koutsimani *et al.* (2022), who emphasised that professional and life experience contributes to reducing vulnerability to burnout and improves the ability to regulate emotions.

A comparison with other studies indicates a certain universality of the observed patterns: R. Bianchi *et al.* (2021) identified comparable age-related differences in anxiety and burnout levels and emphasised the importance of the early stages of professional adaptation in the development of emotional exhaustion and DP. In addition, S.L.D. Restubog *et al.* (2020) highlighted the negative impact of anxiety on PA, which is also confirmed by the findings of this study ($r = -0.36$). Thus, the results of the study demonstrate a stable and statistically significant relationship between anxiety levels and manifestations of emotional burnout, confirming the relevance of developing preventive psychological support programmes. This is particularly important for young adults aged 20-24, who are characterised by increased psycho-emotional sensitivity and insufficiently developed adaptive resources. The obtained data substantiate the necessity of implementing preventive measures aimed at developing adaptive stress-regulation strategies, enhancing emotional stability, and supporting motivation as well as a sense of self-efficacy during professional and social development.

CONCLUSIONS

The study enabled a comprehensive assessment of the relationship between anxiety levels and manifestations of emotional burnout among young adults aged 20-36. The average level of anxiety in the sample was moderate, but younger respondents aged 20-24 show significantly higher levels compared to older groups, indicating increased psycho-emotional vulnerability in the early stages of social and professional adaptation. Analysis of the components of emotional burnout showed that the most pronounced among the participants is emotional exhaustion, mainly at a moderate level, with higher rates among younger respondents. Depersonalisation and reduced personal achievement are less pronounced, indicating the gradual formation of these aspects of burnout and their accumulation under conditions of prolonged psycho-emotional stress. Age analysis indicated a tendency toward a decrease in levels of emotional exhaustion and depersonalisation in older participants, which may be associated with more developed adaptive resources and the ability to regulate stressful situations more effectively.

Correlation analysis confirmed the existence of a significant relationship between anxiety levels and manifestations of emotional burnout. It was found that increased anxiety was positively correlates with emotional exhaustion and depersonalisation and negatively with a sense of personal achievement. This indicates that high levels of anxiety are associated with increase susceptibility to psycho-emotional exhaustion, emotional distancing, and decreased motivation, self-esteem, and sense of effectiveness. Age analysis showed that the impact of anxiety on manifestations of burnout is more pronounced in younger respondents, while older participants are characterised by a more stable psycho-emotional state and a preserved sense of personal achievement. The obtained results are of practical importance for psychologists, coaches, teachers, and organisational consultants. The results point to the need for the targeted development of adaptive stress regulation strategies, the formation of emotional stability, and effective self-regulation mechanisms among young people. This reduces the risk of emotional burnout in the early stages of professional and social development and emphasises the importance of specialised psychological support and prevention programmes for psycho-emotional overload.

Prospects for further research lie in the study of the mechanisms of anxiety's impact on burnout, taking into account age, sociocultural, and professional differences, as well as in researching the effectiveness of psychological interventions for preventing and reducing the manifestations of emotional burnout in young people. Further research may focus on the identification and analysis of effective mechanisms for mitigating the impact of anxiety on emotional burnout, particularly through the development of emotional intelligence, the implementation of psychological support programmes, teaching self-regulation and stress-management techniques, and optimising professional workloads and organisational working conditions.

ACKNOWLEDGEMENTS

None.

FUNDING

None.

CONFLICT OF INTEREST

None.

REFERENCES

[1] American Psychological Association. (2017). *Ethical principles of psychologists and code of conduct*. Retrieved from https://www.apa.org/ethics/code.

[2] Andrade, C. (2020). The limitations of online surveys. *Indian Journal of Psychological Medicine*, 42(6), 575-576. doi: 10.1177/0253717620957496.

[3] Bianchi, R., Verkuilen, J., Schonfeld, I.S., Hakanen, J.J., Jansson-Fröjmark, M., Manzano-García, G., Laurent, E., & Meier, L.L. (2021). Is burnout a depressive condition? A 14-sample meta-analytic and bifactor analytic study. *Clinical Psychological Science*, 9(4), 579-597. doi: 10.1177/2167702620979597.
[4] Buzhynska, S.M., & Boichenko, A.O. (2019). Influence of hypertension for the development of emotional pregnancy syndrome in students of pedagogical profile of teaching. *Theory and Practice of Modern Psychology*, 5(1), 87-92. doi: 10.32840/2663-6026.2019.5-1.14.
[5] Erikson, E.H. (1950). *Childhood and society*. New York: W.W. Norton & Company.
[6] Field, A. (2020). *Discovering statistics using IBM SPSS statistics (5th ed)*. London: Sage Publications.
[7] Folkman, S., & Moskowitz, J.T. (2004). Coping: Pitfalls and promise. *Annual Review of Psychology*, 55(1), 745-774. doi: 10.1146/annurev.psych.55.090902.141456.
[8] Hao, Z., Jin, L., Huang, J., Lyu, R., & Cui, Q. (2021). Academic burnout and problematic smartphone use during the COVID-19 Pandemic: The effects of anxiety and resilience. *Frontiers in Psychiatry*, 12, article number 725740. doi: 10.3389/fpsyt.2021.725740.
[9] Julian, L.J. (2011). Measures of anxiety: State-Trait Anxiety Inventory (STAI), Beck Anxiety Inventory (BAI), and Hospital Anxiety and Depression Scale-Anxiety (HADS-A). *Arthritis Care & Research*, 63(S11), S467-S472. doi: 10.1002/acr.20561.
[10] Knowles, K.A., Jessup, S.C., & Olatunji, B.O. (2018). Disgust in anxiety and obsessive-compulsive disorders: Recent findings and future directions. *Current Psychiatry Reports*, 20, article number 68. doi: 10.1007/s11920-018-0936-5.
[11] Koutsimani, P., Montgomery, A., & Georganta, K. (2022). Cognitive functioning in non-clinical burnout: Using cognitive tasks to disentangle the relationship in a three-wave longitudinal study. *Frontiers in Psychiatry*, 13, article number 978566. doi: 10.3389/fpsyt.2022.978566.
[12] Leiter, M.P. (2021). Assessment of workplace social encounters: Social profiles, burnout, and engagement. *International Journal of Environmental Research and Public Health*, 18(7), article number 3533. doi: 10.3390/ijerph18073533.
[13] Maslach, C., & Jackson, S.E. (1981). The measurement of experienced burnout. *Journal of Organizational Behavior*, 2(2), 99-113. doi: 10.1002/job.4030020205.
[14] McLeod, S. (2025). *Erik Erikson's stages of psychosocial development*. Retrieved from https://www.simplypsychology.org/Erik-Erikson.html.
[15] Restubog, S.L.D., Ocampo, A.C.G., & Wang, L. (2020). Emotional exhaustion and anxiety. *Journal of Vocational Behavior*, 118, article number 103402. doi: 10.1016/j.jvb.2020.103440.
[16] Salvagioni, D.A.J., Melanda, F.N., Mesas, A.E., González, A.D., Gabani, F.L., & de Andrade, S.M. (2017). Physical, psychological and occupational consequences of job burnout: A systematic review of prospective studies. *PLOS ONE*, 12(10), article number e0185781. doi: 10.1371/journal.pone.0185781.
[17] Sevinc, S.A., Metin, S., Basi, N.B., Cinar, A.S., Ozkan, M.T., & Oba, S. (2022). Anxiety and burnout in anesthetists and intensive care unit nurses during the COVID-19 pandemic: A cross-sectional study. *Brazilian Journal of Anesthesiology*, 72(2), 169-175. doi: 10.1016/j.bjane.2021.07.011.
[18] Skapinakis, P. (2014). Spielberger state-trait anxiety inventory. In A.C. Michalos (Ed.), *Encyclopedia of quality of life and well-being research*. Dordrecht: Springer. doi: 10.1007/978-94-007-0753-5_2825.
[19] Solonyna, O.I. (2021). Social anxiety tendencies in students with different levels of burnout. (Master's thesis, Ukrainian Catholic University, Lviv, Ukraine).
[20] Spielberger, C.D. (2010). State-trait anxiety inventory. In I.B. Weiner & W.E. Craighead (Eds.), *The Corsini encyclopedia of psychology*. Hoboken: Wiley. doi: 10.1002/9780470479216.corpsy0943.
[21] Wright, K.B. (2006). Researching internet-based populations: Advantages and disadvantages of online survey research, online questionnaire authoring software packages, and web survey services. *Journal of Computer-Mediated Communication*, 10(3), article number JCMC1034. doi: 10.1111/j.1083-6101.2005.tb00259.x.
[22] Zhang, H., Ye, Z., Tang, L., Zou, P., Du, C., Shao, J., Wang, X., Chen, D., Qiao, G., & Mu, S.Y. (2020). Anxiety symptoms and burnout among Chinese medical staff of intensive care unit: The moderating effect of social support. *BMC Psychiatry*, 20, article number 197. doi: 10.1186/s12888-020-02603-2.
[23] Zhou, J., Yang, Y., Qiu, X., Yang, X., Pan, H., Ban, B., Qiao, Z., Wang, L., & Wang, W. (2016). The relationship between anxiety and burnout among Chinese physicians: A moderated mediation model. *PLOS ONE*, 11(8), article number e0157013. doi: 10.1371/journal.pone.0157013.

Марія Тюганова
Асистент
Державний університет економіки та технологій
50005, вул. Медична, 16, м. Кривий Ріг, Україна
https://orcid.org/0009-0007-5016-1688
Юлія Маєр
Кандидат наук з психології, доцент
Миколаївський національний аграрний університет
54020, вул. Георгія Гонгадзе, 9, м. Миколаїв, Україна
https://orcid.org/0000-0002-9472-643X
Аліна Бархота
Студент
Державний університет економіки та технологій
50005, вул. Медична, 16, м. Кривий Ріг, Україна
https://orcid.org/0000-0002-7857-3613

Психологічні особливості взаємозв'язку тривожності та емоційного вигорання

Анотація. У статті представлені результати емпіричного дослідження, присвяченого вивченню взаємозв'язку рівня тривожності та схильності до емоційного вигорання серед молодих дорослих віком 20-36 років. Метою дослідження було з'ясувати, як тривожність пов'язана з емоційним вигоранням та його проявами у молодих дорослих. У дослідженні взяли участь 134 особи, дослідження проводилося в онлайн-форматі, що забезпечило охоплення різних соціальних та професійних контекстів та збереження анонімності респондентів. Оцінка тривожності здійснювалася за допомогою Шкали тривожності Спілбергера, а рівня емоційного вигорання – за Методикою Маслач, що включає компоненти емоційного виснаження, деперсоналізації та зниження особистісних досягнень. Результати показали, що молодші учасники віком 20-24 роки мають підвищений рівень тривожності та більш виражене емоційне виснаження, тоді як деперсоналізація та зниження особистісних досягнень проявляються менш інтенсивно. Кореляційний аналіз підтвердив наявність значущого позитивного зв'язку між рівнем тривожності та проявами емоційного виснаження і деперсоналізації, а також негативного зв'язку з відчуттям особистісних досягнень, що свідчить про вплив тривожності на психоемоційний стан та мотивацію молодих дорослих. Отримані дані підкреслюють важливість розробки профілактичних та психологічних програм, спрямованих на розвиток адаптивних стратегій регуляції стресу, підвищення емоційної стійкості та формування ефективних копінг-стратегій у молоді. Дослідження створює наукову основу для подальшого вивчення механізмів впливу тривожності на емоційне вигорання, у тому числі з урахуванням вікових, гендерних та соціокультурних особливостей, а також для оцінки ефективності психологічних інтервенцій, спрямованих на профілактику та корекцію вигорання серед молодих дорослих

Ключові слова: психоемоційне виснаження; особистісна ефективність; психологічна стійкість; стресові чинники; емоційна регуляція

UDC 159.923:159.942:159.955
DOI: 10.52534/msu-pp2.2026.92

ISSN 2413-3329
E-ISSN 2520-6788

Vladyslav Dzhedzheia*
Postgraduate Student
Dragomanov Ukrainian State University
01601, 9 Pyrohova Str., Kyiv, Ukraine
https://orcid.org/0009-0006-4819-175X

Oksana Zazymko
PhD in Psychology, Associate Professor
G.S. Kostiyk Institute of Psychology of the National Academy of Pedagogical Sciences of Ukraine
01033, 2 Pankivska Str., Kyiv, Ukraine
https://orcid.org/0000-0003-0422-3669

Emotional resource as a psychological predictor of critical thinking in the digital society

Article's History:
Received: 21.01.2026
Revised: 24.04.2026
Accepted: 25.05.2026
Published: 29.06.2026

Suggested Citation:
Dzhedzheia, V., & Zazymko, O. (2026). Emotional resource as a psychological predictor of critical thinking in the digital society. *Scientific Bulletin of Mukachevo State University. Series "Pedagogy and Psychology"*, 12(2), 92-101. doi: 10.52534/msu-pp2.2026.92.

*Corresponding author
(vladyslavdzhedzheia@gmail.com)

Abstract. In the context of information overload in the digital society and deliberate manipulative influences, critical thinking has become a fundamental psychological competence, while the psychological resources underpinning it remain insufficiently explored. The aim of this study was to investigate the role of emotional regulatory resources as a psychological factor influencing critical thinking among individuals in early adulthood within the digital society. The study was conducted on a sample of young adults (N = 274; aged 20-36 years), active users of the digital environment residing in Ukraine. A comprehensive set of methods was employed, including the Critical Thinking Test, the Difficulties in Emotion Regulation Scale (DERS), and the Intolerance of Uncertainty Scale (IUS-12), all in their Ukrainian-language adaptations. Statistical analysis included the Kruskal-Wallis test with pairwise comparisons, Spearman's rank correlation analysis, and multiple regression analysis using the stepwise method. Comparative analysis across groups with different levels of critical thinking revealed statistically significant differences in four of the six DERS subscales. The most pronounced differences were observed in lack of emotional clarity and difficulties engaging in goal-directed behaviour. Among the components of intolerance of uncertainty, significant group differences were identified only for prospective anxiety. Correlation analysis confirmed a differentiated pattern of associations: lack of emotional clarity demonstrated the strongest negative association with critical thinking, followed by difficulties engaging in goal-directed behaviour and prospective anxiety. Reactive-impulsive components (non-acceptance of emotional responses, impulse control difficulties, and inhibitory anxiety) showed no significant associations with critical thinking. The regression model explained 59.8% of the variance in critical thinking. Independent predictors included emotional clarity, goal-directed behaviour, absence of prospective anxiety, and emotional awareness. The findings indicate that only the cognitively oriented components of emotional regulatory resources possess predictive value for critical thinking, whereas reactive-impulsive components appear to be neutral. The practical significance of the findings lies in substantiating priority targets for psychological interventions aimed at fostering critical thinking among young adults. Developing emotional clarity and the ability to maintain

Copyright © The Author(s). This is an open access article distributed under the terms of the Creative Commons Attribution License 4.0 (https://creativecommons.org/licenses/by/4.0/)

cognitive goal orientation under conditions of distress may be incorporated into digital mental hygiene and media literacy programmes

Keywords: motional clarity; goal-directed behaviour under conditions of distress; tolerance of uncertainty; youth media literacy; digital environment; cognitive self-regulation; information manipulation

INTRODUCTION

The digitalisation of society has fundamentally transformed the conditions under which individuals process information and make decisions. In the context of information overload, algorithmically amplified misinformation, and deliberate manipulative influences, critical thinking (CT) has become a fundamental psychological competence rather than merely an educational construct. The ability to critically evaluate the credibility of information, identify logical fallacies, and resist cognitive biases has become an essential prerequisite for effective adaptation to the contemporary information environment. The development of CT is particularly important during periods of societal crisis, armed conflict, and the rapid expansion of digital technologies, when the quality of individual decision-making depends largely on the capacity for independent and well-reasoned analysis of information.

G. Pennycook & D.G. Rand (2021), in a comprehensive review, concluded that the inability to distinguish true information from misinformation is primarily attributable to a lack of analytical thinking and excessive reliance on cognitive heuristics, thereby shifting the research focus from the social context to the individual's internal psychological resources. A. Kwek *et al.* (2023), in a systematic review, further confirmed that disengagement from analytical thinking is a key psychological determinant of vulnerability to misinformation. They emphasised that protection against misinformation is provided not by analytical thinking per se, but by analytical thinking specifically directed towards evaluating the truthfulness of information. These findings indicate that effective resistance to information manipulation requires not only cognitive skills but also the psychological resources necessary to sustain their effective application.

This issue becomes even more acute under conditions of war and deliberate information aggression. Contemporary warfare is conducted not only on the battlefield but also within the media environment, where information operations are designed to create disorientation, foster polarisation, and undermine society's capacity for critical evaluation of events. M. Markova *et al.* (2024) found that one of the principal objectives of information warfare is to reduce the population's CT through targeted psychological operations that systematically impair individuals' ability to evaluate information rationally and promote enduring patterns of uncritical information processing. A. Paziuk *et al.* (2025), in their study of cognitive warfare in the context of the Russian-Ukrainian conflict, demonstrated that manipulative narratives generate self-reinforcing cycles of misinformation which become increasingly self-sustaining over time, while the development of CT represents a strategic priority for societal resilience under conditions of hybrid aggression. L.V. Chernukha (2023) conceptualised CT as a means of overcoming information illiteracy within the wartime media environment, arguing that strategies for the critical evaluation of information constitute an essential component of psychological protection for all segments of the population, from ordinary citizens to professionals required to make decisions under conditions of informational uncertainty. In circumstances where information aggression is not a temporary phenomenon but a permanent feature of the environment in which individuals function, CT ceases to be merely an academic skill and becomes a fundamental instrument of psychological self-protection and the preservation of individual cognitive sovereignty.

Susceptibility to misinformation is not evenly distributed across the population but is determined by identifiable psychological factors. M. Sultan *et al.* (2024) found that young adults constitute a particularly vulnerable group with regard to online misinformation. This developmental period is characterised by high levels of digital engagement, intensive use of social media as the primary source of information, and epistemic self-regulatory mechanisms that are still developing. At the same time, the authors demonstrated that individual psychological characteristics, including analytical disposition, openness to experience, and reflective capacity, account for substantially more variance in susceptibility to manipulation than demographic variables. These findings indicate that protection against misinformation is fundamentally a psychological rather than a technical challenge and therefore requires the deliberate development of appropriate personal resources.

Among the psychological resources that support the stability of CT, emotional regulatory resources are of particular theoretical relevance. M. Li *et al.* (2022) demonstrated empirically that emotion regulation and CT are closely related constructs, with the ability to regulate one's affective states directly influencing the quality of analytical reasoning. S. Cheng (2022) confirmed this relationship in an independent sample, showing that emotion regulation is a significant predictor of performance on cognitive tasks requiring critical evaluation. Equally important is the construct of intolerance of uncertainty. I. Sahib *et al.* (2023), in a meta-analysis, found that intolerance of uncertainty and deficits in emotion regulation constitute closely related transdiagnostic mechanisms that jointly undermine individuals' capacity for balanced epistemic behaviour.

J.M. Marcos-Vílchez *et al.* (2025), in a systematic review of the effectiveness of CT training programmes, concluded that psychological interventions targeting individuals' internal resources are more effective in the long term than purely instructional approaches.

Despite the growing body of research, the component structure of the influence of emotional regulatory resources on CT remains insufficiently verified empirically. Specifically, it is unclear which components of these resources make an independent predictive contribution and whether different dimensions of intolerance of uncertainty are equally important for the level of CT among individuals in early adulthood within the digital society. Investigating these questions in a sample of young adults, who represent the most active users of the digital environment, constitutes an important scientific task. The aim of the present study was to determine the role of emotional regulatory resources as a psychological factor in the development of CT among individuals in early adulthood within the digital society. To achieve this aim, the following objectives were established: (1) to determine the nature and strength of the relationships between components of emotion regulation, tolerance of uncertainty, and the level of CT in a sample of young adults; and (2) to identify the independent predictive contribution of each component of emotional regulatory resources to the variance in CT using regression analysis.

LITERATURE REVIEW

The methodological foundations of contemporary CT research were established in the seminal work of P.A. Facione (1990), who, in the Delphi Report, defined critical thinking as purposeful, self-regulatory judgement and identified six core cognitive skills underlying it: interpretation, analysis, evaluation, inference, explanation, and self-regulation. This model remains the principal framework for the operationalisation of CT in contemporary empirical research. However, while it describes the structure of CT, it does not explain which psychological resources support its stable implementation under conditions of affective pressure and information overload. This issue has become particularly important within the context of the digital society. A central theoretical framework for understanding such resources is the process model of emotion regulation proposed by J.J. Gross (2015). At the level of component analysis, it is important to emphasise that not all components of emotion regulation are equally associated with cognitive processes. Gross distinguishes between antecedent-focused strategies (such as cognitive reappraisal and the identification of emotional states) and response-focused strategies (such as expressive suppression and impulsive reactions). For the effective implementation of CT, the former are of particular importance, among which the construct of emotional clarity plays a pivotal role. Emotional clarity refers to the ability to identify and differentiate one's own affective states. An unrecognised affective state does not disappear from the evaluative process; rather, it functions as an "invisible bias", systematically distorting judgement (Aldao *et al.*, 2010). This mechanism explains why, under conditions of algorithmically amplified emotional content on digital platforms, emotional clarity becomes not merely an adaptive resource but a fundamental prerequisite for the epistemically independent evaluation of information.

The second key component of emotional regulation is the ability to maintain goal-directed behaviour under conditions of distress. A. Aldao *et al.* (2010), in a meta-analysis of 114 studies, demonstrated that this subscale is the most sensitive indicator of impaired executive control, even more so than the overall measure of dysregulation. In a digital environment, where constant task-switching and information overload are the norm, maintaining cognitive focus despite affective pressure becomes a critical mechanism for carrying out analytical tasks. At the same time, the reactive-impulsive components of dysregulation (a tendency to judge one's own emotional reactions and difficulties with impulse control) are, according to theoretical assumptions, less relevant to the quality of CT, as they do not directly interfere with the process of information processing. A similar distinction between cognitively oriented and reactive components is also evident in the structure of intolerance of uncertainty (IU). The two-factor model proposed by R.N. Carleton *et al.* (2007) raises an important question: are both dimensions of IU equally linked to CT. Theoretically, anticipatory anxiety is a chronic cognitive disposition that forms a persistent pattern of uncertainty avoidance and "premature judgement closure" – accepting the first plausible answer to reduce epistemic discomfort rather than to arrive at the truth. In a digital environment, where algorithmic systems offer "convenient" answers based on the user's previous behaviour, high predictive anxiety can create a synergistic risk: both the internal disposition and the external environment jointly push the individual towards uncritical confirmation of existing beliefs. Inhibitory anxiety, by contrast, is a situational affective-behavioural reaction and is not necessarily linked to the quality of analytical judgement as such. This distinction, in the context of CT, has not yet been empirically verified.

In Ukrainian psychology and related disciplines, research into CT is becoming particularly relevant in the context of full-scale war and escalating information threats. O.G. Rybchuk (2026) theoretically substantiates and empirically verifies the psychological characteristics of CT development in operational-level officers, identifying tolerance for uncertainty and predictive ability as psychological characteristics of CT in conditions of information complexity and time constraints, which conceptually supports the hypothesis that the relationship between IU and CT is dispositional rather than merely situational. In a broader social context, V. Kurilo *et al.* (2023) argue that citizens' cognitive skills constitute the primary defence against disinformation and cyber-manipulation, as information warfare is waged in parallel with conventional warfare. At a philosophical and practical level, S.V. Kutsepal (2022) regards CT as a "metacognitive strategy of resistance" that ensures an individual's intellectual autonomy in the face

of aggressive propaganda through the ability to identify manipulation and information sabotage. O.V. Zazymko & O. Shylovska (2024) have shown that the capacity for reflective contemplation of one's own experience acts as a metacognitive integrator, uniting the affective processing of situations with the making of informed decisions; that is, it fulfils a function structurally akin to emotional clarity within the framework of CT. This parallel is theoretically significant, as it suggests that emotional clarity and reflectivity may be manifestations of a single metacognitive-affective mechanism, the investigation of which requires separate empirical verification.

A synthesis of the available theoretical and empirical data reveals a significant gap in the scientific literature: despite the obvious theoretical link between the emotional-regulatory resource and metacognition, the component structure of this link remains empirically unverified. In particular, it remains unclear which specific components of the emotional resource (cognitively oriented or reactive-impulsive) act as independent predictors of the level of CT, and whether tolerance of uncertainty is equally significant across its various dimensions, or only in its anticipatory, dispositional dimension. Accordingly, the aim of the present study was to provide a theoretical rationale for and empirically verify the role of emotional regulatory resources as psychological predictors of CT among individuals in early adulthood within the digital society.

MATERIALS AND METHODS

The study was conducted within the framework of the psychological resource-based approach to the investigation of CT in the digital society. Within this framework, CT is conceptualised as an integrated psychological characteristic whose effective functioning is supported by a system of interrelated personal resources. Emotional resources are regarded as an inhibitory construct within this system, such that deficits in their adaptive functioning directly reduce an individual's capacity for epistemically sound evaluation of information in the digital environment. The study was implemented in three stages: a preparatory stage (operationalisation of constructs, selection of research instruments, and pilot testing of the authors' questionnaire), a main stage (data collection), and an analytical stage (statistical analysis and interpretation of the findings). Data were collected online using Google Forms during 2025-2026. Participation was voluntary and anonymous, and all participants provided informed consent in accordance with the ethical principles for research involving human participants established by the World Medical Association (2013). A purposive sampling strategy was employed, targeting individuals in early adulthood who were active users of the digital environment. Inclusion criteria were: age between 20 and 36 years, regular (daily) use of digital devices, and residence in Ukraine. The exclusion criterion was a self-reported history of psychiatric diagnosis. The final sample comprised N = 274 participants (M = 27.1 years), including 217 women (79.2%) and 57 men (20.8%). Educational attainment was distributed as follows: 24.8% had incomplete higher education, 31.8% held a bachelor's degree, 33.6% held a master's degree, 8.8% possessed a doctoral or other academic degree, and 1.1% reported other educational qualifications. The sample size was considered statistically sufficient for multiple regression analysis and the detection of medium-sized effects (Field, 2018).

The level of CT was assessed using the Critical Thinking Test developed by L. Starke in the Ukrainian adaptation by E.L. Lutsenko (2014). Prior to categorising participants according to their level of CT, the normality of score distribution was examined using the Shapiro-Wilk test. As the distribution significantly deviated from normality ($W = 0.965$, $p < 0.001$), CT levels were established using quartile-based norming within the study sample as local norms. This procedure ensured adequate differentiation of participants for subsequent comparative analyses and was consistent with the recommendations of the adaptation's author regarding the development of local norms for specific social groups. Emotional resources were operationalised using two complementary instruments that capture both intrapersonal and interpersonal dimensions of emotional functioning within the digital context: the Difficulties in Emotion Regulation Scale (DERS) (Gratz & Roemer, 2004), in the Ukrainian adaptation (Sak & Fedotova, 2023), and the Intolerance of Uncertainty Scale-12 (IUS-12), in the Ukrainian adaptation by H.M. Hromova (2021).

The DERS assesses six components of difficulties in emotion regulation: non-acceptance of emotional responses, difficulties engaging in goal-directed behaviour under conditions of distress, impulse control difficulties, lack of emotional awareness, limited access to emotion regulation strategies, and lack of emotional clarity, defined as the inability to identify and differentiate one's own emotional states. Higher scores on each subscale indicate greater difficulties and, consequently, lower levels of emotional resources. The DERS was selected as the principal measure of emotional resources because it encompasses both procedural dimensions of emotion regulation (access to regulation strategies and impulse control) and cognitive-metacognitive dimensions (emotional awareness, emotional clarity, and goal-directed behaviour), all of which are functionally related to the processes underlying CT. The IUS-12 assesses two relatively independent dimensions: prospective anxiety, reflecting the tendency to cognitively anticipate the negative consequences of uncertainty and a desire to control the future, and inhibitory anxiety, representing an affective-behavioural response to present uncertainty that inhibits action. The inclusion of the IUS-12 in the operationalisation of emotional resources was based on the premise that intolerance of uncertainty is an emotional-cognitive construct reflecting individuals' affective responses to uncertain situations and directly influencing the quality of epistemic behaviour in digital environments, where informational uncertainty is the norm rather than the exception. Individuals with higher levels of intolerance of uncertainty are more likely to engage in premature closure of judgement and to

accept the first plausible explanation uncritically, both of which constitute direct obstacles to the effective application of CT. The regression model presented in this article was derived from a broader investigation of the psychological resources underlying CT in early adulthood and comprises eight predictors drawn from three resource domains. The present article focuses specifically on the four predictors representing emotional regulatory resources, whose contribution was analysed while controlling for the remaining variables in the model. Accordingly, detailed consideration is limited to predictors belonging to the emotional regulatory domain. The remaining variables were included in the regression model as control factors to ensure an accurate estimation of the unique contribution of the emotional regulatory indicators; however, their substantive interpretation falls beyond the scope of the present article and will be addressed in subsequent publications.

Statistical analyses were performed using IBM SPSS Statistics 23. The normality of distributions was assessed using the Shapiro-Wilk test. Comparative analyses between groups with different levels of CT were conducted using the Kruskal-Wallis test with post hoc pairwise comparisons. Spearman's rank correlation analysis was employed to determine the strength and direction of associations between variables. The predictive contribution of emotional resource indicators to the variance in CT was examined using stepwise multiple regression analysis. The assumptions of regression analysis were evaluated by examining the distribution of standardised residuals and scatterplots. The level of statistical significance for all analyses was set at $p \leq 0.05$.

RESULTS AND DISCUSSION

Descriptive statistics for the DERS indicated a moderate level of difficulties in emotion regulation. The greatest difficulties were observed for limited access to emotion regulation strategies and lack of emotional awareness, whereas lack of emotional clarity and difficulties engaging in goal-directed behaviour were comparatively less pronounced. Based on quartile norming, the following CT categories were established: low (≤15 points; n = 103, 37.6%), moderate (16-18 points; n = 119, 43.4%), and high (≥19 points; n = 52, 19.0%). The Kruskal-Wallis test revealed statistically significant differences between groups with different levels of CT for four of the six DERS subscales, as well as for the overall DERS score. In every statistically significant case, individuals with higher levels of CT exhibited fewer difficulties in emotion regulation. The largest differences were observed for lack of emotional clarity and difficulties engaging in goal-directed behaviour, with exceptionally large differences in mean ranks between the low- and high-CT groups (191.32 versus 46.41 and 173.17 versus 40.93, respectively). By contrast, non-acceptance of emotional responses and impulse control difficulties did not differ significantly across CT groups (Table 1).

Table 1. Descriptive statistics for the DERS subscales and the results of the comparative analysis by levels of critical thinking

Subscale	M	SD	H (KW)	p
Rejection of emotional reactions	15.45	2.33	0.186	0.911
Difficulties with goal-directed behaviour	13.80	2.29	103.025	<0.001
Difficulties with impulse control	16.19	1.94	0.230	0.892
Lack of emotional awareness	18.35	2.74	19.921	<0.001
Limited access to coping strategies	22.24	2.61	6.669	0.036
Lack of emotional clarity	12.61	2.16	120.814	<0.001
Overall DERS score	98.65	7.50	91.678	<0.001

Note: KW – Kruskal-Wallis test; significant results are presented in italics
Source: compiled by the authors

According to the IUS-12 profile, the sample was characterised predominantly by a moderate level of intolerance of uncertainty (83.9%), with prospective anxiety being more pronounced than inhibitory anxiety. Significant differences in IUS-12 scores were identified for prospective anxiety and the overall intolerance of uncertainty score. In both cases, individuals with higher levels of CT demonstrated lower rank scores (indicating lower intolerance of uncertainty and, consequently, greater tolerance of uncertainty). By contrast, no significant differences were found for inhibitory anxiety, suggesting that it is specifically the anticipatory, cognitive dimension of intolerance of uncertainty that is associated with CT (Table 2).

Table 2. IUS-12 scores: descriptive statistics and comparative analysis by levels of CT

Subscale	M	SD	H (KW)	p
Prospective anxiety	21.65	3.65	34.400	<0.001
Inhibitory anxiety	14.80	2.54	2.658	0.265
Total score	36.46	4.98	28.945	<0.001

Note: KW – Kruskal-Wallis test; significant results are presented in italics
Source: compiled by the authors

Spearman's rank correlation analysis confirmed and quantitatively refined the observed associations, revealing a differentiated pattern of relationships. Among the DERS subscales, lack of emotional clarity demonstrated the strongest negative association with CT. This construct reflects an inability to identify and differentiate one's own emotional states. The second strongest association was observed for the overall emotion dysregulation score, followed by difficulties engaging in goal-directed behaviour. A moderate negative association was found for lack of emotional awareness, while a weak negative association was observed for limited access to emotion regulation strategies. By contrast, non-acceptance of emotional responses and impulse control difficulties showed no significant associations with CT. These findings indicate that cognitively oriented components of emotion regulation are significant correlates of CT, whereas reactive-impulsive components appear to be unrelated to it. For the IUS-12, significant negative associations with CT were identified for prospective anxiety and the total IUS-12 score. Inhibitory anxiety, however, showed no significant association with CT (Table 3).

Table 3. Spearman's rank correlations between emotional resource indicators and individual critical thinking (rs, N = 274)

Indicator	rs	p
DERS (difficulties in emotion regulation scale)		
Lack of emotional clarity	−0.625	<0.001
Difficulties engaging in goal-directed behaviour	−0.488	<0.001
Lack of emotional awareness	−0.229	<0.001
Limited access to emotion regulation strategies	−0.127	0.036
Non-acceptance of emotional responses	−0.044	0.465 (n.s.)
Impulse control difficulties	−0.021	0.728 (n.s.)
Overall indicator (integrative)	−0.514	<0.001
IUS-12 (intolerance of uncertainty scale)		
Prospective anxiety	−0.365	<0.001
Inhibitory anxiety	−0.096	0.111 (n.s.)
Overall IU index	−0.336	<0.001

Note: DERS and IUS-12 scores reflect deficits in emotional resources; n.s. = statistically non-significant result
Source: developed by the authors

Particular attention should be paid to the pattern of associations between the subscales of the two instruments. The total IU score demonstrated moderate positive correlations with prospective anxiety ($rs = 0.846$; $p < 0.001$) and inhibitory anxiety ($rs = 0.682$; $p < 0.001$), confirming that both belong to the same underlying construct. The correlation between the prospective anxiety and inhibitory anxiety subscales was moderate ($rs = 0.237$; $p < 0.001$), indicating their relative independence. Correlations among the DERS subscales varied in both direction and strength. The total DERS score showed strong positive correlations with difficulties engaging in goal-directed behaviour ($rs = 0.640$; $p < 0.001$), limited access to emotion regulation strategies ($rs = 0.589$; $p < 0.001$), and non-acceptance of emotional responses ($rs = 0.525$; $p < 0.001$). Notably, lack of emotional clarity, which emerged as the strongest correlational predictor of CT, demonstrated a somewhat weaker correlation with the total DERS score ($rs = 0.503$; $p < 0.001$) and relatively weak correlations with most of the remaining DERS subscales, suggesting its relative independence within the structure of emotion regulation.

The associations between the IUS-12 and DERS were generally of moderate magnitude. The total IU score (IUS-12) was positively correlated with non-acceptance of emotional responses ($rs = 0.290$; $p < 0.001$) and limited access to emotion regulation strategies ($rs = 0.221$; $p < 0.001$) as measured by the DERS. Inhibitory anxiety was positively associated with non-acceptance of emotional responses ($rs = 0.395$; $p < 0.001$) and impulse control difficulties ($rs = 0.249$; $p < 0.001$), but negatively associated with lack of emotional awareness ($rs = -0.264$; $p < 0.001$), suggesting that individuals with lower emotional awareness paradoxically experienced lower levels of inhibitory anxiety. By contrast, prospective anxiety was virtually unrelated to most DERS subscales, with the exception of weak positive correlations with lack of emotional clarity ($rs = 0.158$; $p = 0.009$) and the total DERS score ($rs = 0.188$; $p = 0.002$), confirming the conceptual independence of the cognitive dimension of uncertainty-related anxiety from general difficulties in emotion regulation. Notably, lack of emotional awareness was negatively associated with inhibitory anxiety ($rs = -0.264$; $p < 0.001$), impulse control difficulties ($rs = -0.280$; $p < 0.001$), and non-acceptance of emotional responses ($rs = -0.274$; $p < 0.001$), which, in addition to the interpretation outlined above, may indicate that reduced emotional awareness serves a compensatory function with respect to the reactive components of emotion dysregulation. Multiple regression analysis (stepwise method, N = 274) confirmed the statistical appropriateness of the procedure (normality of residuals: $M \approx 0$; $SD = 0.985$; range = −3.70 to 3.01; homoscedasticity: satisfied). The final model was statistically significant: $F(8, 265) = 49.238$; $p < 0.001$; $R^2 = 0.598$; Adjusted $R^2 = 0.586$. The model explained 59.8% of the variance in CT and refers to the

complete eight-factor model. Among the indicators of emotional regulatory resources, lack of emotional clarity made the largest standardised contribution (β = −0.387), followed by difficulties engaging in goal-directed behaviour (β = −0.305) and prospective anxiety (β = −0.255). Lack of emotional awareness retained an independent contribution after controlling for the remaining predictors (β = −0.084; p = 0.044) (Table 4).

Table 4. Regression model of predictors of critical thinking (stepwise method, N = 274)

Predictor	B	β	t	p	rs	p (rs)
Lack of emotional clarity (DERS)	−0.474	−0.387	−8.417	<0.001	−0.625	<0.001
Difficulties engaging in goal-directed behaviour (DERS)	−0.353	−0.305	−6.922	<0.001	−0.488	<0.001
Lack of emotional awareness (DERS)	−0.081	−0.084	−2.027	0.044	−0.229	<0.001
Prospective anxiety (IUS-12)	−0.185	−0.255	−6.184	<0.001	−0.365	<0.001

Note: dependent variable: CT; $R^2 = 0.598$; Adjusted $R^2 = 0.586$; $F(8,265) = 49.238$; $p < 0.001$; rs – Spearman's rank correlation coefficient, presented for comparison with the independent predictive contribution
Source: developed by the authors

The findings reveal the differentiated and hierarchically organised role of emotional regulatory resources as psychological predictors of CT in the digital society. The central conclusion of the study is that it is not emotion regulation, but rather its cognitively oriented components – namely, the ability to identify and differentiate one's own emotional states and to maintain goal-directed behaviour under conditions of distress – that constitute the principal correlates and independent predictors of CT. This conclusion should be considered in relation to the existing literature and interpreted within the context of the distinctive characteristics of the digital environment. The strongest association observed across the entire dataset was for lack of emotional clarity: the higher the level of CT, the more accurately individuals identified and differentiated their own emotional states. This finding is consistent with the concept of emotional granularity, developed by L.F. Barrett *et al.* (2001), according to which the ability to make fine-grained distinctions between one's affective states is a prerequisite for adaptive functioning in cognitively demanding situations. Within the digital environment, where emotional triggers – including algorithmically curated content, misinformation, and emotionally provocative social media discourse – are pervasive and persistent, the inability to distinguish "what I am feeling at this moment" directly undermines the capacity to evaluate information independently of its affective content. The strength of the observed association (rs = −0.625) deserves particular attention, as correlations of this magnitude are uncommon in non-parametric psychological research and suggest that emotional clarity is not merely an accompanying factor but a component structurally linked to CT.

The second strongest predictor, difficulties engaging in goal-directed behaviour, retained an independent contribution in the regression model even after controlling for lack of emotional clarity, indicating a distinct underlying mechanism. This finding is theoretically grounded in the concept of executive control, according to which maintaining cognitive focus under conditions of emotional arousal is essential for the implementation of analytical processes. Findings reported by A. Aldao *et al.* (2010), based on large clinical and non-clinical samples, demonstrated that this DERS subscale is the most sensitive indicator of impairments in cognitive functioning. Specifically, the inability to maintain organised, goal-directed behaviour under affective pressure represents a common feature of both clinical syndromes and subclinical cognitive deficits. Within the digital context, this mechanism becomes particularly important, as information overload and the constant switching between tasks characteristic of interactions with digital platforms place continuous demands on the ability to sustain goal-directed behaviour. Under such conditions, deficits in this resource become especially detrimental (Ophir *et al.*, 2009).

By contrast, the reactive-impulsive components of emotion regulation (non-acceptance of emotional responses and impulse control difficulties) showed no significant associations with CT. This null finding is both methodologically important and substantively informative. It indicates that emotional reactivity as a temperamental characteristic is essentially unrelated to epistemic competence. Individuals may be emotionally reactive, inclined to judge their own emotional responses negatively, or prone to impulsive reactions while nevertheless retaining the capacity for critical analysis, provided that they are able to identify their emotional states and maintain cognitive focus.

The findings concerning intolerance of uncertainty, which serves a regulatory function for emotions in the digital environment, reveal a similar pattern of differentiation. Prospective anxiety (a cognitive orientation towards controlling the future and avoiding uncertain situations) was significantly negatively associated with CT and retained an independent predictive contribution after controlling for the DERS indicators. By contrast, inhibitory anxiety, as a situational affective response to present uncertainty, was unrelated to CT. In their two-factor model of intolerance of uncertainty, R.N. Carleton *et al.* (2007) argued that prospective anxiety is a more cognitively demanding construct associated with chronic epistemic dispositions, whereas inhibitory anxiety primarily reflects a situational, temperament-based response. The present study provides the first empirical test of this distinction directly in the context of CT, demonstrating that it is not intolerance of uncertainty in general that is relevant, but specifically its chronic,

cognitive, prospective component. This finding can be explained theoretically by the mechanism of premature closure of judgement: individuals with elevated prospective anxiety tend to accept the first plausible answer in order to reduce the discomfort associated with uncertainty, which is the direct antithesis of CT (Dugas *et al.*, 2004; Stanovich, 2011). In the digital society, where recommendation algorithms provide "convenient" answers based on users' previous behaviour, high prospective anxiety may create a synergistic risk whereby both internal dispositions and the external environment jointly encourage the uncritical confirmation of existing beliefs.

Comparison of the present findings with related research reveals both consistency and novelty. L. Kraft *et al.* (2023), in a longitudinal study, demonstrated that emotional clarity during adolescence and early adulthood predicts academic achievement, a construct that conceptually overlaps with CT. M.N. Turliuc & M. Jitaru (2019) similarly confirmed an association between overall emotion regulation and analytical thinking in a student sample. However, none of the available studies has conducted a component-level analysis of the DERS in relation to CT using a regression approach capable of determining the independent contribution of each subscale while controlling for the others. This component-specific analysis therefore represents the principal scientific contribution of the present study. It demonstrates that emotional clarity and goal-directed behaviour are functionally distinct predictors of CT, rather than merely indicators of general emotional well-being.

In discussing these findings, attention should also be given to the contextual factor of the digital society as the environment in which CT is exercised. The findings of the present study consistently support this perspective. Among the sample of young adults, 37.6% of whom spent more than six hours online each day, it was the cognitively oriented components of emotional regulatory resources, rather than the duration of digital engagement, that emerged as the principal predictors of CT. This supports a qualitative rather than quantitative understanding of digital engagement and reinforces the rationale for incorporating emotional regulatory resources into models of digital literacy. Nevertheless, several limitations should be acknowledged, indicating directions for future research. The cross-sectional design does not permit conclusions regarding the direction of causal relationships. It is possible that higher levels of CT facilitate the development of emotional clarity rather than vice versa, or that both constructs develop concurrently under the influence of shared underlying factors. Longitudinal studies and experimental designs are therefore required to verify these causal relationships.

CONCLUSIONS

The findings of the present study confirm that an individual's emotional resources constitute a significant psychological predictor of CT in the digital society. However, the nature of this relationship is differentiated rather than homogeneous. The strongest predictive role is played by cognitively oriented components of emotional resources, particularly the individual's ability to identify and differentiate their own emotional states and to maintain goal-directed behaviour under conditions of affective pressure. Analysis of the pattern of associations between indicators of emotion regulation and intolerance of uncertainty further demonstrated the heterogeneous nature of emotional regulatory resources. Specifically, lack of emotional clarity, which emerged as the strongest predictor of CT in the regression model, exhibited relative autonomy within the structure of emotion regulation, demonstrating weaker associations with most other DERS subscales than the remaining components. At the same time, prospective anxiety proved to be conceptually distinct from general difficulties in emotion regulation, as it was virtually unrelated to most DERS indicators.

These findings suggest that the key determinants of CT are not overall emotional well-being or the absence of negative emotional experiences, but rather specific cognitive-regulatory mechanisms associated with understanding one's own emotions, maintaining goal-directed behaviour, and patterns of cognitive responding to uncertainty. These characteristics constitute the psychological foundation that enables independent and unbiased evaluation of information within the digital environment. By contrast, reactive-impulsive components of emotional resources, such as the tendency to judge one's own emotional responses negatively and impulse control difficulties, were unrelated to the level of CT. This indicates that emotional reactivity as a temperamental characteristic does not hinder CT, provided that cognitive-regulatory mechanisms remain intact. Among the components of tolerance of uncertainty, only prospective anxiety demonstrated predictive value for CT. This construct is conceptualised as a chronic cognitive orientation towards avoiding uncertain situations that serves an emotion-regulatory function in the digital environment.

Inhibitory anxiety, despite its association with general anxiety, did not predict CT, highlighting the specific role of the anticipatory, dispositional dimension of intolerance of uncertainty as a component of emotional resources. At the same time, it should be noted that the explanatory power of the model ($R^2 = 0.598$) reflects the contribution of the complete eight-predictor model, whereas the emotion regulation variables demonstrate their unique contribution to CT after controlling for the influence of the remaining resource-related factors. This finding highlights the multidimensional nature of CT and the need for its further investigation within comprehensive resource-based models of personality. Future research should focus on verifying the causal nature of the identified relationships through longitudinal and experimental designs, as well as examining the mediating role of emotional resources in the relationship between motivational characteristics of personality and CT, which requires dedicated mediation analysis.

ACKNOWLEDGEMENTS

None.

FUNDING

None.

CONFLICT OF INTEREST

None.

REFERENCES

[1] Aldao, A., Nolen-Hoeksema, S., & Schweizer, S. (2010). Emotion-regulation strategies across psychopathology: A meta-analytic review. *Clinical Psychology Review*, 30(2), 217-237. doi: 10.1016/j.cpr.2009.11.004.
[2] Barrett, L.F., Gross, J., Christensen, T.C., & Benvenuto, M. (2001). Knowing what you're feeling and knowing what to do about it: Mapping the relation between emotion differentiation and emotion regulation. *Cognition & Emotion*, 15(6), 713-724. doi: 10.1080/02699930143000239.
[3] Carleton, R.N., Norton, M.A.P.J., & Asmundson, G.J.G. (2007). Fearing the unknown: A short version of the intolerance of uncertainty scale. *Journal of Anxiety Disorders*, 21(1), 105-117. doi: 10.1016/j.janxdis.2006.03.014.
[4] Cheng, S. (2022). Exploring the role of translators' emotion regulation and critical thinking ability in translation performance. *Frontiers in Psychology*, 13, article number 1037829. doi: 10.3389/fpsyg.2022.1037829.
[5] Chernukha, L.V. (2023). Critical thinking in wartime. In *Psychological readings: Proceedings of the 9th scientific and practical conference of young researchers* (pp. 213-215). Kharkiv: KhNUVS.
[6] Dugas, M.J., Buhr, K., & Ladouceur, R. (2004). The role of intolerance of uncertainty in etiology and maintenance of generalized anxiety disorder. In R.G. Heimberg, C.L. Turk & D.S. Mennin (Eds.), *Generalized anxiety disorder: Advances in research and practice* (pp. 143-163). New York: The Guilford Press.
[7] Facione, P.A. (1990). *Critical thinking: A statement of expert consensus for purposes of educational assessment and instruction. Research findings and recommendations*. Newark: American Philosophical Association.
[8] Field, A. (2018). *Discovering statistics using IBM SPSS statistics* (5th ed.). Los Angeles: SAGE.
[9] Gratz, K.L., & Roemer, L. (2004). Multidimensional assessment of emotion regulation and dysregulation. *Journal of Psychopathology and Behavioral Assessment*, 26(1), 41-54. doi: 10.1023/B:JOBA.0000007455.08539.94.
[10] Gross, J.J. (2015). Emotion regulation: Current status and future prospects. *Psychological Inquiry*, 26(1), 1-26. doi: 10.1080/1047840X.2014.940781.
[11] Hromova, H.M. (2021). Uncertainty tolerance measurement tools. Intolerance of uncertainty scale, short version of N. Carleton Ukrainian adaptation. *Scientific Studies on Social and Political Psychology*, 47(50), 115-130.
[12] Kraft, L., Ebner, C., Leo, K., & Lindenberg, K. (2023). Emotion regulation strategies and symptoms of depression, anxiety, aggression, and addiction in children and adolescents: A meta-analysis and systematic review. *Clinical Psychology: Science and Practice*, 30(4), 485-502. doi: 10.1037/cps0000156.
[13] Kurilo, V., Karaman, O., Bader, S., Pochinková, M., & Stepanenko, V. (2023). Critical thinking as an information security factor in the modern world. *Social and Legal Studios*, 6(3), 67-74. doi: 10.32518/sals3.2023.67.
[14] Kutsepal, S.V. (2022). Critical thinking as a means of resistance in information warfare. *The Bulletin of Yaroslav Mudryi National Law University. Series: Philosophy, Philosophy of Law, Political Science, and Sociology*, 54(3), 104-115. doi: 10.21564/2663-5704.54.265682.
[15] Kwek, A., Peh, L., Tan, J., & Lee, J.X. (2023). Distractions, analytical thinking and falling for fake news: A survey of psychological factors. *Humanities and Social Sciences Communications*, 10, article number 367. doi: 10.1057/s41599-023-01813-9.
[16] Li, M., Heydarnejad, T., Azizi, Z., & Rezaei Gashti, Z. (2022). Modeling the role of emotion regulation and critical thinking in immunity in higher education. *Frontiers in Psychology*, 13, article number 1005071. doi: 10.3389/fpsyg.2022.1005071.
[17] Lutsenko, E.L. (2014). Adaptation of L. Starkey's critical thinking test. *Visnyk of V.N. Karazin Kharkiv National University. Series Psychology*, 55(1110), 65-70.
[18] Marcos-Vílchez, J.M., Muñiz-Velázquez, J.A., Arraztio-Cordoba, A., & Sánchez-Martín, M. (2025). Effectiveness of training actions aimed at improving critical thinking in the face of mis- and disinformation: A systematic review. *Humanities and Social Sciences Communications*, 12, article number 144. doi: 10.1057/s41599-025-06143-6.
[19] Markova, M., Aliieva, T., Abdriakhimova, T., Prib, H., & Markov, A. (2024). Impact of excessive interest in news related to the war on mental health in conditions of big invasion and information war: Experience of Ukraine. *European Psychiatry*, 67(S1), article number S668. doi: 10.1192/j.eurpsy.2024.1388.
[20] Ophir, E., Nass, C., & Wagner, A.D. (2009). Cognitive control in media multitaskers. *Proceedings of the National Academy of Sciences*, 106(37), 15583-15587. doi: 10.1073/pnas.0903620106.
[21] Paziuk, A., Lande, D., Shnurko-Tabakova, E., & Kingston, P. (2025). Decoding manipulative narratives in cognitive warfare: A case study of the Russia-Ukraine conflict. *Frontiers in Artificial Intelligence*, 8, article number 1566022. doi: 10.3389/frai.2025.1566022.
[22] Pennycook, G., & Rand, D.G. (2021). The psychology of fake news. *Trends in Cognitive Sciences*, 25(5), 388-402. doi: 10.1016/j.tics.2021.02.007.
[23] Rybchuk, O.G. (2026). *Psychological features of the development of critical thinking in operational-level officers*. (PhD thesis, National University of Defense of Ukraine, Kyiv, Ukraine).
[24] Sahib, I., Chen, J., Cárdenas, D., & Calear, A.L. (2023). Intolerance of uncertainty and emotion regulation: A meta-analytic and systematic review. *Clinical Psychology Review*, 101, article number 102270. doi: 10.1016/j.cpr.2023.102270.

[25] Sak, L.V., & Fedotova, Z.V. (2023). Cross-cultural adaptation and validation of the Ukrainian version of the Difficulties in Emotion Regulation Scale (DERS): Testing in adolescents with anorexia nervosa and their parents/guardians. *Psychiatry, Neurology and Medical Psychology*, 21, 38-45. doi: 10.26565/2312-5675-2023-21-05.
[26] Stanovich, K.E. (2011). *Rationality and the reflective mind.* Oxford: Oxford University Press. doi: 10.1093/acprof:oso/9780195341140.001.0001.
[27] Sultan, M., Tump, A.N., Ehmann, N., Lorenz-Spreen, P., Hertwig, R., Gollwitzer, A., & Kurvers, R.H.J.M. (2024). Susceptibility to online misinformation: A systematic meta-analysis of demographic and psychological factors. *Proceedings of the National Academy of Sciences*, 121(47), article number e2409329121. doi: 10.1073/pnas.2409329121.
[28] Turliuc, M.N., & Jitaru, M. (2019). Interpersonal emotion regulation – a concept in search of clarification. *Revista de Psihologie*, 65(4), 281-291.
[29] World Medical Association. (2013). World Medical Association Declaration of Helsinki: Ethical principles for medical research involving human subjects. *JAMA*, 310(20), 2191-2194. doi: 10.1001/jama.2013.281053.
[30] Zazymko, O.V., & Shilovska, O. (2024). Semantic space of youth as a factor in the formation of life competence in the conditions of war. *Technologies of Intellect Development*, 8(2(36)). doi: 10.31108/3.2024.8.2.1.

Владислав Джеджея
Аспірант
Український державний університет імені Михайла Драгоманова
01601, вул. Пирогова, 9, м. Київ, Україна
https://orcid.org/0009-0006-4819-175X
Оксана Зазимко
Кандидат психологічних наук, доцент
Інститут психології імені Г. С. Костюка Національної академії педагогічних наук України
01033, вул. Паньківська, 2, м. Київ, Україна
https://orcid.org/0000-0003-0422-3669

Емоційний ресурс як психологічний предиктор критичного мислення особистості в цифровому суспільстві

Анотація. В умовах інформаційного перенасичення цифрового суспільства та цілеспрямованих маніпулятивних впливів критичне мислення набуває значення базової психологічної компетентності особистості, психологічні ресурси якої залишаються недостатньо вивченими. Метою дослідження було вивчення ролі емоційно-регуляторного ресурсу як психологічного чинника критичного мислення особистості раннього дорослого віку в цифровому суспільстві. Дослідження виконано на вибірці молодих дорослих (N = 274; вік 20-36 років), активних користувачів цифрового середовища, які проживають в Україні. Застосовано комплекс методів: Тест критичного мислення, Шкала труднощів емоційної регуляції (DERS) та Шкала інтолерантності до невизначеності (IUS-12) в україномовних адаптаціях. Статистична обробка включала критерій Kruskal-Wallis з попарними порівняннями, кореляційний аналіз за Spearman та множинний регресійний аналіз методом покрокового включення. Порівняльний аналіз між групами з різним рівнем критичного мислення виявив статистично значущі відмінності за чотирма із шести субшкал DERS: найбільш вираженими є відмінності за відсутністю емоційної чіткості та труднощами із цілеспрямованою поведінкою. З-поміж компонентів інтолерантності до невизначеності значущі відмінності встановлено лише для прогностичної тривоги. Кореляційний аналіз підтвердив диференційовану структуру зв'язків: найсильніший зворотний зв'язок із критичним мисленням демонструє відсутність емоційної чіткості, далі – труднощі із цілеспрямованою поведінкою та прогностична тривога. Реактивно-імпульсивні компоненти (неприйняття емоційних реакцій, труднощі з контролем імпульсів та гнітюча тривога) значущих зв'язків із критичним мисленням не виявили. Регресійна модель пояснює 59,8 % дисперсії критичного мислення; незалежними предикторами є емоційна чіткість, цілеспрямована поведінка, відсутність прогностичної тривоги та усвідомлення емоцій. Встановлено, що предикторною силою щодо критичного мислення наділені виключно когнітивно-орієнтовані компоненти емоційно-регуляторного ресурсу, тоді як реактивно-імпульсивні є нейтральними. Практична цінність результатів полягає в обґрунтуванні пріоритетних мішеней психологічного сприяння розвитку критичного мислення молодих дорослих: розвиток емоційної чіткості та здатності зберігати когнітивну спрямованість в умовах дистресу може бути включено до програм цифрової психогігієни та медіаграмотності

Ключові слова: емоційна чіткість; цілеспрямована поведінка в умовах дистресу; толерантність до невизначеності; медіаграмотність молоді; цифрове середовище; когнітивна саморегуляція; інформаційні маніпуляції

НАУКОВИЙ ВІСНИК
МУКАЧІВСЬКОГО ДЕРЖАВНОГО УНІВЕРСИТЕТУ
СЕРІЯ «ПЕДАГОГІКА ТА ПСИХОЛОГІЯ»

Науковий журнал

Том 12, № 2, 2026

Оригінал-макет видання виготовлено
у редакційно-видавничому відділі Мукачівського державного університету

Відповідальний редактор:
К. Мовчан

Підписано до друку 25.05.2026 р.
Формат 60*84/8
Умовн. друк. арк. 11,9
Тираж: 300 прим.

Адреса видавництва:
Мукачівський державний університет
89600, вул. Ужгородська, 26, м. Мукачево, Україна
E-mail: info@pp-msu.com.ua
https://pp-msu.com.ua

SCIENTIFIC BULLETIN
OF MUKACHEVO STATE UNIVERSITY
SERIES "PEDAGOGY AND PSYCHOLOGY"

Scientific Journal

Vol. 12, No. 2, 2026

The original layout of the publication is made
in the publishing department of Mukachevo State University

Managing Editor:
K. Movchan

Signed for print 25.05.2026.
Format 60*84/8
Conventional printed pages 11.9
Circulation 300 copies

Publishing Address:
Mukachevo State University
89600, 26 Uzhhorodska Str., Mukachevo, Ukraine
E-mail: info@pp-msu.com.ua
https://pp-msu.com.ua/en