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Encyclopaedia of Ukrainian education in the independence era: A thesaurus of theory, practice, and personalities

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Abstract. The relevance of this study stemmed from the need for a comprehensive examination of the terminological and conceptual framework of pedagogy, based on the principles of classical and modern encyclopaedics. The article aimed to provide an in-depth analysis of the most authoritative contemporary encyclopaedic publications, assessed regarding encyclopaedic standards, structural content, Ukrainian-centred perspectives, and alignment with European traditions. Appropriate theoretical, empirical-theoretical, and empirical methods have been employed to conduct a thorough study of the body of pedagogical knowledge through the lens of its terminological and conceptual apparatus and precedent figures, with a preference for methods such as definition analysis, content analysis, comparative analysis, and classification. The study offered a multifaceted examination of the processes of nomination, lexicography, and terminography of scientific denotations, integrating the criterion of "pedagogical and educational realities". The research focused on landmark encyclopaedic publications within a clearly defined chronological scope – namely, the late 20th and early 21st centuries (the independence era). The subject of analysis included the Ukrainian pedagogical dictionary and Ukrainian pedagogical encyclopaedic dictionary by S.U. Honcharenko, Pedagogical Dictionary edited by M.D. Yarmachenko, the first and second editions of the collective work Encyclopaedia of Education by the National Academy of Sciences of Ukraine, and the draft of The Great Encyclopaedia. A thematic index of entries within the field of Pedagogical Sciences has been developed, structuring

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a "genealogical tree of concepts" through content-rich thematic groups that represent Pedagogical Sciences in the Great Universal Encyclopaedia. An attempt has been made to classify the examined encyclopaedic content by identifying the most typical models based on unifying markers such as "specialised publication", "regional publication", "personal publication", and "encyclopaedic publication proper". The study has been conducted through a synchronic-diachronic lens, with a focus on a compendium of knowledge concerning cultivated pedagogical and educational terminology, as well as notable figures representing various dimensions of pedagogy and education. The specificity of the selected works, the definitional standards of the entries, and their relevant characteristics have been thoroughly interpreted, considering the balance between encyclopaedic universality and the idiosyncratic stylistic features of individual publications and the broader context. A comparative analysis of the publications has been undertaken to provide a comprehensive characterisation of the dynamic processes within the pedagogical and educational terminological-conceptual system, viewed against the backdrop of national and global scholarly and historical-cultural developments. The findings of this study may be applied in encyclopaedography, terminography, and the teaching of pedagogical subjects

Keywords: educational sphere; pedagogical encyclopaedic publications; terminological-conceptual framework; pedagogical dictionary; pedagogical sciences

Introduction

One of the most telling indicators of a society's development and prestige is the level of its encyclopaedic endeavours. Encyclopaedias, as the most systematic bearers of information, have not only retained their significance since their inception over 600 years ago but have actually grown in importance. An encyclopaedic boom, whether on a national or global scale, always plays a positive role, as it deepens understanding and propels society towards new intellectual and spiritual horizons. Interest in encyclopaedics, encyclopaediography, and encyclopaedic content is constant, driven by a multitude of factors, primarily the evolution of the multifunctional encyclopaedic paradigm. This paradigm incorporates pedagogical knowledge with a broad range of content, as well as traditional and modern technologies and production methods. The formation of this socially significant discourse, represented by encyclopaedic and linguistic compendia of knowledge, is an ongoing process influenced by linguistic and extralinguistic factors such as economic, political, ideological, and cultural conditions. This process is primarily influenced by the overall progress of science and the development of both established and newly emerging fields of study. Moreover, it is significantly determined by the dynamics of the language situation, including the struggle between archaic stereotypes and new trends in language planning and development, changes in language policy and legislation, and linguistic migration phenomena. The latter refers to instances where one language substantially influences another with more advanced encyclopaedic traditions, a more systematic and comprehensive structure of terms, and concepts.

Ukrainian encyclopaedics and lexicography have followed a distinctive path of development, characterised by their unique national features. Pedagogical science, with its specific terminology and conceptual apparatus, is no exception. The origins of educational and pedagogical encyclopaedics can be traced back to ancient times. The formation of a multi-genre terminological system on a national basis, which intensified in the late 19th and early 20th centuries with the establishment of the Institute of the Ukrainian Scientific Language (and its pedagogicalpsychological section), remains ongoing. This process has become even more acute in the last decade due to the dynamic

sociolinguistic situation, marked by a decline in the prestige of the Russian language and a significant weakening of its functional activity in the context of the fullscale Russian-Ukrainian war. The focus is primarily on developing a national encyclopaedic framework, which is shaped by several key factors. Firstly, it involves the organisation of pedagogical terminology according to various criteria, structured within hypernym-hyponym relationships. Secondly, it requires refining the internal differentiation and integration of this terminology into a coherent system. Thirdly, it entails the compilation of a register of precedentsetting figures in the field.

The societal priorities reflected in pedagogical theory and practice are evident in the fact that pedagogical terminology has become an integral part of various specialised and universal encyclopaedias, dictionaries, reference dictionaries, and handbooks in fields such as philosophy, psychology, medicine, politics, and political science. Conversely, pedagogy itself is in constant interaction with the conceptual apparatus of other sciences, continuously incorporating terms and concepts from newly emerging fields such as andragogy, biblical pedagogy, military pedagogy, embryonic pedagogy, ethnic pedagogy, integral pedagogy, Cossack pedagogy, museum pedagogy, neo-pedagogy, pedagogy of good, pedagogy of peace, pedagogy of work, developmental pedagogy, environmental pedagogy, penitentiary pedagogy, preventive pedagogy, prenatal pedagogy, social pedagogy, and theatrical pedagogy, among others. Given these factors, it is essential to address the issue of encyclopaedisation within Ukrainian pedagogy and education in a broad sense – from national to European and global theoretical and practical entities, and from Ukrainian personalities to those at the European and global level. Equally important is the task of systematising pedagogical terminology.

Researchers are actively engaged in exploring criteria for typological differentiation of encyclopaedias, including electronic publications, and conducting systematic analyses of pedagogical terminology using various classification parameters through a synchronic and diachronic lens, with a particular emphasis on contemporary developments. M. Zhelezniak *et al.* (2021) have conducted extensive research on the first problem, proposing to distinguish between: 1) universal, sectoral, specialised, and regional editions – based on the nature of information; 2) scientific, popular science, and popular editions – based on their intended purpose; 3) alphabetical, systematic, and alphabetical-systematic publications – based on their structure; 4) publications aimed at the general public, specific specialists, youth, and children – based on the target audience. The most productive category is publications based on the criterion of "different types of information", such as: "specialised + personal", "sectoral + personal", "specialised + regional", "sectoral + regional", "specialised + regional + personal", "sectoral + regional + personal", and so on. It is essential, however, to consider several fundamental aspects: 1) all types of encyclopaedias are a specific form of literature that "reflects the culture of universal knowledge, its organisation and systematisation on the one hand, and its preservation and dissemination on the other"; 2) encyclopaedias are "more than just books; they are a form and means of universal knowledge, a distinct phenomenon in the sphere of knowledge, and their development in world culture; a special way of thinking that involves the generalisation, systematisation, and comparison of knowledge" (Ishchenko & Stepanenko, 2024).

The role of electronic encyclopaedias is a pressing issue in contemporary research. Scholars such as A. Yatsyshyn *et al.* (2021) emphasise the need to study and generalise international experiences in creating such works. They categorise electronic encyclopaedias into two types: 1) those "created by adapting print encyclopaedias for web-based environments" and 2) those "created not by publishers but by readers (according to the rules of each project)". Researchers V. Bykov *et al.* (2022) convincingly argue for the significance of web-based encyclopaedic publications, highlighting their role in preserving the heritage of national pedagogy, popularising science, and disseminating scientific information.

The integration of these modern information carriers into educational settings is another pressing issue (Dashko, 2023). Electronic encyclopaedias offer promising and convenient didactic tools, as they "provide significant opportunities for successful learning, emphasise the most important aspects of a learning topic, create conditions for systematising and generalising information, and ultimately contribute to active engagement in independent work, capable of stimulating students' interest in learning and increasing their overall motivation" (Zhelezniak, 2020).

In the era of independence, the issue of forming a terminological resource has become exceptionally acute. Scholars such as A. Gurzhiy *et al.* (2022) and A. Yatsyshyn (2023) rightly emphasise that the active processes driven by globalisation and the exponential growth of scientific data in the 21st century have led to trends toward the universalisation of intellectual life. As a result, the terminological and conceptual apparatus is undergoing constant transformation, with new terms emerging and their definitions undergoing significant changes and periodic refinements. Consequently, "there is a clear need to address the problem of forming, systematising, unifying, and updating the conceptual and terminological apparatus of all fields of knowledge, including psychological and pedagogical sciences". Another important research area is the expansion of the terminological corpus on a national basis, which occurs in two ways: 1) the creation of new terms and concepts based on national foundations and 2) the return to active use of native terminology that was previously excluded from scientific discourse for various reasons, primarily ideological. This process is characterised by two trends: 1) the displacement of borrowed terms and concepts and their replacement with native Ukrainian equivalents and 2) competition between borrowed and native terms and concepts, resulting in the replenishment of the latter with terminological units that function as alternative or exclusive norms.

Within the scholarly discourse on this topic, it is crucial to highlight the contributions of researchers who have outlined the prospects for the encyclopaedisation of education. Valuable insights are provided regarding the content, structure of categorical and conceptual apparatus, and criteria for selecting entries. T. Filimonova (2020) suggests creating a thematic register of entries in the field of Pedagogical Sciences based on the criteria of "frequency and stability of use", "relevance", and "explanatory potential", which are specific instances of the broader strategies of "general-specific" and "more important-less important". S. Lapaienko (2021), characterising the factual nature and multifaceted nature of psychological and pedagogical knowledge, as well as the categorisation and systematisation of informational and reference material for a comprehensive understanding of the studied segment of entries, clearly pragmatises and substantiates the aforementioned conceptual foundation, lending it credibility. Regarding the interpretation of the encyclopaedic rank of the analysed works, this important aspect of encyclopaedics, encyclopaediography, and lexicography has not yet been subjected to close scrutiny by researchers. This article aimed to conduct a comprehensive analysis of the genre, content, and definitional structure of recent publications with classical markers of encyclopaedic quality, which, through the system of naming pedagogical and educational realities and characterising pedagogical personalities, reflect the state of development of Ukrainian pedagogical science, educational progress, and societal development as a whole.

Materials and Methods

At the initial stage of the study, a descriptive method was employed to organise the material, systematically catalogue encyclopaedic publications, and establish the terminological corpus of a given study from synchronic-diachronic, traditional-innovative, and structural-functional perspectives, among others. The methods of comprehensive sampling and definition analysis were used to determine the classification of terms within the field of pedagogy in general and

specific subdomains in particular. The second and most critical stage involved a series of interconnected, multi-tiered methods, among which the following were of particular significance: content analysis – to develop the theoretical foundations, justify the strategic conceptual principles of the proposed scholarly discourse, and refine the terminology for denoting both traditional and modern pedagogical realities; comparative-contrastive method – to analyse the content and structural features of identical terms across different scholarly discourses by the same or different authors; comparative method – to compare the essence of the studied terms and concepts, determining their place and role in the formation of the Ukrainian conceptual-terminological paradigm; componential analysis – to establish the hierarchical rank of a scientific denotatum and assess its status; classification method – to identify and group terms and concepts according to specified criteria; definitional method – to interpret the definitional standard of an encyclopaedic entry. The research procedure was concluded with the application of quantitative methods, which enabled the identification of the mechanisms driving dynamic changes in pedagogy, influenced by the development of both Ukrainian and global scholarship. These methods facilitated a comprehensive analysis of the process of updating the pedagogical content of a given encyclopaedic publication, improving the methodology for defining entries, and standardising the conceptual-terminological framework.

This study employed a combination of scientific and general research methods, including analysis, synthesis, induction, and deduction, to systematically examine the characteristics and content of several pedagogical encyclopaedias. These methods have been widely recognised as effective tools for systematically reflecting on the laws of the objective world. Using this methodological framework, the study comprehensively characterised the content, structural specificity, and popularity of the following encyclopaedias: Ukrainian Pedagogical Dictionary by S. Honcharenko (1997), Ukrainian Pedagogical Encyclopaedic Dictionary by S. Honcharenko (2011), Pedagogical Dictionary edited by M. Yarmachenko (2001), and two editions of the Encyclopaedia of Education (Kremen, 2008; Kremen *et al.*, 2021). Additionally, the study analysed The Great Encyclopaedia. Thematic Register of Slogans in the Field of Pedagogical Sciences (Kyrydon, 2020) in comparison to the others. The findings indicate that, except for the latter, which is presented as a project for a future fundamental encyclopaedia, these publications most adequately meet the canons of encyclopaedias. They effectively demonstrate "activity directed at the creation of knowledge" (Pylypenko & Fedorova, 2020), conveying knowledge from the specific field of pedagogy and related disciplines. This involves interdisciplinary approaches and methods of cognition that "arise at the intersection of different scientific disciplines", serving as "a progressive tool for obtaining new knowledge" and reflecting "the understanding of science as a qualitatively new type of communicative tool" (Ishchenko & Stepanenko, 2024). This trend is recognised, supported, and expanded upon by the progressive world.

Results and Discussion

Typology and classification of encyclopaedic editions on pedagogy and education in the era of independence

It is worth reiterating that "the presence of encyclopaedic publications in various fields of science, technology, culture, and the national economy is a sign of a nation's level of education, intellectual development, and readiness for independent statehood" (Honcharenko, 2011). It is also important to emphasise the existence of various approaches to classifying encyclopaedic publications and the technology of preparing their content, which is characterised by "two interconnected and relatively opposite processes: tradition and innovation", where "in both cases, scientists use postulates in the form of a terminological system in a complex metalinguistic environment of conceptual definitions" of pedagogy as a

science (Ivanytska, 2017). This refers to the preservation and development of specific terminology, "the definition of new lexical elements and their interpretation at the current stage of social development, and a fundamentally new interpretation of familiar words in the context of educational reform and the country's European integration" (Serebrianska, 2019).

Another type of specific encyclopaedic representatives emerges when using the classification scheme proposed by N. Chernysh (2015), which, based on the criterion of "target purpose", distinguishes three types of encyclopaedias: scientific, popular-scientific, and practical. A closer analysis reveals that a definitive classification of the analysed works within these categories has yet to be established. A positive aspect to highlight is the gradual disappearance of the ethnically indistinct practice of encyclopaedia compilation, lexicography, and terminography. Ukrainian authors who have studied the historical-pedagogical aspects of the Ukrainian terminological system "have not clearly distinguished between Russian authors, Russian/Soviet terminology, and Ukrainian ones, which would have brought their own understanding to the content of the concepts under consideration" (Sukhomlynska, 2021). Furthermore, the integration of powerful search functions, electronic catalogues, video, animation, and other modern technologies into encyclopaedias is a significant achievement (Usyk & Astapov, 2011). Complementing these modern encyclopaedic standards is the need to align the compendium of knowledge with the level of perception of the contemporary, discerning recipient, including their aesthetic, ethical, axiological, pragmatic views, beliefs, and preferences (Trishchuk, 2018).

The pedagogical and educational continuum of knowledge is represented in all the types of encyclopaedic publications discussed above. This highlights a significant trend: "many pedagogical phenomena and laws have an interdisciplinary character". Therefore, "the pedagogical terminological system should be considered as a set of concepts from pedagogy and related fields such as psychology, philosophy, physiology, medicine, informatics, sociology, political science, and so on", where "only the pedagogical meaning should be highlighted in terms that belong to other fields of science" (Honcharuk, 2009). The most common type of work for the analysed chronological period is characterised by a syncretic nature with multi-vector informational components. The first type is clearly demonstrated by specialised pedagogical encyclopaedic publications of pedagogical terms (Semenova, 2006; Krutii & Funtikova, 2010; Lukianova & Anishchenko, 2017). The second type is explicitly represented by specialised, regional, and personal studies (Prokopenko & Lozova, 1994; Bilousko, 2017). The third type is formed by pedagogical encyclopaedic works, which are the focus of this article.

This study focused on a group of publications that, through their content and terminological framework, reflect the dynamics of Ukrainian pedagogical science in a retrospective and modern context. These publications include the Encyclopaedia of Education (Kremen, 2008; Kremen *et al.*, 2021), the Ukrainian Pedagogical Dictionary (1st edition) and the Ukrainian Pedagogical Encyclopaedic Dictionary (2nd edition) by S. Honcharenko (1997; 2011), and the Pedagogical Dictionary edited by M. Yarmachenko (2001). Furthermore, the study considered the future potential of the Great Universal Encyclopaedia (The Great Encyclopaedia. Thematic Register of Slogans in the Field of Pedagogical Sciences) (Kyrydon, 2020). It is noteworthy that the titles of two of these publications include the lexemes "encyclopaedia" and "encyclopaedic", which serve as semantic constants and clear linguistic markers of their status as encyclopaedic editions.

The Ukrainian Pedagogical Dictionary and Ukrainian Pedagogical Encyclopaedic Dictionary by S. Honcharenko, and the Pedagogical Dictionary edited by M. Yarmachenko

It is important to highlight that the Ukrainian Pedagogical Dictionary by S. Honcharenko (1997) is the earliest work in the analysed encyclopaedic

context. According to the author, its purpose was "on the one hand, to initiate a systematic scientific work on Ukrainian pedagogical terminology, to enrich it, and to bring it into line with the terminology accepted in developed countries, and on the other hand, to provide a large number of scientists, teachers, and other education workers with a reference encyclopaedic publication that summarises and systematises a fairly complete body of information on the theory, history, and practice of teaching and education". Based on the criterion of "nature of information", this dictionary, along with the subsequent one, can be classified as multidisciplinary-personal encyclopaedic works, as they include, in addition to pedagogical terms and concepts, terms and concepts from related sciences such as philosophy, psychology, medicine, and informatics, as well as personalities selected based on their "level of achievement as an educator or scientist in the field of education and pedagogical science, and the positive evaluation of their work by the public" (Honcharenko, 2011). A distinctive feature of this work is that all entries are presented without references to sources, indicating a more complex and demanding approach to structuring the entry – authorial interpretation. The length of the entries varies, determined by the significance of the term or concept and its status within the terminological paradigm. The absence of strict uniformity is noteworthy and has its advantages, as it allows for the identification and appropriate interpretation of the inherent characteristics of the publication and the author's idiosyncratic style.

The Ukrainian Pedagogical Dictionary shares similarities with the Ukrainian Pedagogical Encyclopaedic Dictionary in that both include "a generalised and systematised overview of the theory and practice of teaching and education" (Kremen, 2008; Kremen, *et al.*, 2021), with the main distinction being the amount of information, or more specifically, the number of entries (around 3,000 in the first edition and 4,000 in the second). This is clearly demonstrated by a comparative analysis of the entries under the letter "A" (English: A): 198 entries in 1997 and 230 in 2011, and under the letter "Я" (English: Y): 13 entries in 1997 and 19 in 2011. Some biblionyms have been clarified ("Algebra" → "Algebra and the Fundamentals of Analysis"; "Certification of Educational Workers" → "Certification of Scientific and Pedagogical Workers", etc.), and new entries have been introduced ("Art therapy", "Avant-garde", "Accommodation", "Axiom", "Axiomatic method", "Alternative educational technologies", "I-category", "Quality of education", "Personality qualities", etc.), a significant percentage of which are newly formed concepts as well as established ones. The personal segment of the dictionary has been notably expanded with entries such as "Ananin Stepan Andriiovych", "Arvat Fedir Stepanovych", "Yavonenko Oleksandr Fedotovych", "Carl Robert Jakobson", and "Yaroshenko Olha Hryhorivna". Therefore, it can be confidently stated that the author has creatively worked on the new edition of his work, which has become a significant phenomenon within the educational community.

The publication of the Pedagogical Dictionary edited by M. Yarmachenko (2001) marked another significant step in the encyclopaedisation of education during the period under review. With 2,513 entries, it might seem redundant to have another dictionary of a similar genre published by the same institution, the National Academy of Educational Sciences of Ukraine, within such a short span of four years. However, this perception is challenged by the arguments presented by M. Yarmachenko (2001) himself, who contributed 1,478 entries (59% of the total). He highly values S. Honcharenko's (1997) dictionary, noting its broad range of reference materials, while also cautioning that the number of words and concepts covered is still limited, with the entries themselves being rather concise. The editor justifies the need for his own dictionary by highlighting the continuation of a tradition initiated in the 1920s of creating pedagogical dictionaries in Ukraine, such as the Dictionary of Pedagogical Terms from 1926, and the Russian-Ukrainian translated, rather than the explanatory

Dictionary of Pedagogical, Psychological, and School Self-Governance Terms from 1926-1927. Secondly, the period saw a revitalisation of creative pedagogical thought, resulting in significant changes and transformations that required timely encyclopaedic documentation. Thirdly, there was a surge in innovative activities in various educational institutions. Fourthly, there was a growing interest in pedagogical issues not only among specialists but also among the general public, thus creating a demand for information. In addition to these factors, it is important to mention the need to summarise the long-standing Ukrainian experience and traditions in the field of didactics, education, and folk pedagogy, which is imbued with "ideas of high humanism and true democracy, legendary heroism and courage, great folk humour towards friends and all-consuming sarcasm towards enemies and non-friends" M. Yarmachenko (2001). This evolutionary process is significantly reflected in the terms with a wide denotative range.

The authors of the analysed publication (a total of 76 renowned scientists), as well as the chief editor, aimed to systematically characterise, through terminology, the domains of general pedagogy, general theory of education, extracurricular and out-of-school activities, subject-specific methodologies, technical teaching aids, informatics, school studies, preschool and family education, higher education pedagogy, and more, using both synchronic and diachronic approaches. The interpretation of terms borrowed from related fields, which help to uncover the essential realities of pedagogy and education, was also included. These terms sometimes serve as a kind of methodological foundation for them. More extensive in terms of quantitative composition compared to S. Honcharenko (1997) is the register of personalities. A similar technology of the constitution of the entry is included in the convergence. While M. Yarmachenko (2001) emphasises in the Preface the conciseness of entries in the Ukrainian Pedagogical Dictionary by S. Honcharenko (1997), he himself refrains from overly detailed definitions, skilfully condensing the information instead. It is worth noting that among the authors of the analysed work is also S. Honcharenko, who prepared 37 entries. Some of these either did not make it into his own dictionary ("Autonomous educational institution", "Academic hour", "Rozenberh Mark Yosypovych", etc.) or are interpreted from a different perspective in the analysed work ("Academic freedom", "Individual learning processes", etc.).

The Encyclopaedia of Education, The Great Encyclopaedia. Thematic Register of Slogans in the Field of Pedagogical Sciences

The collective publication Encyclopaedia of Education (Kremen, 2008; Kremen *et al.*, 2021), which has undergone two editions separated by a 13-year interval, stands as the pinnacle of encyclopaedic endeavours in the field under study. This significant period has coincided with radical changes in the Ukrainian education system, including the introduction of the New Ukrainian School, the granting of autonomy to higher education institutions, changes in their status, the expansion of the subject matter of pedagogy, and the updating of educational content and assessment systems. The adoption of a cognitive-discursive scientific paradigm has allowed for a comprehensive interpretation of education as a holistic conceptual framework, enabling the reconstruction of verbal tools for organising information (knowledge, experience) about one of the most strategic spheres of human existence. Moreover, it has facilitated the identification and extrapolation of the priorities of the new education onto an axiological matrix through the lens of a conceptual and linguistic worldview (Serebrianska, 2019).

One of the semantic dominants of the logonym Encyclopaedia of Education is the lexical unit with the semantic organisation of "the sum of knowledge acquired through learning", "the level of knowledge acquired through learning", "raising the level of knowledge", "the general level of knowledge", "a system of educational activities", and "a system of institutions and

establishments through which these activities are carried out", according to V. Busel (2005). Therefore, it is essential to scrutinise the definitional markers of this scientific denotation and the denotation "pedagogy", as well as their derivatives: "educational" and "pedagogical". Their symmetrical and asymmetrical, as well as hypernymic-hyponymic nature, is revealed in the entries "Pedagogy" and "Education" prepared by S. Honcharenko (1997). Using his own directive guideline, according to which "an indisputable rule of scientific logic states that basic concepts and statements must be clearly defined", Honcharenko characterises the correlational-determinative relationships between them as follows: "Pedagogy is a social science that unites, integrates, and synthesises data from all natural and social sciences related to the formation of personality… The object of pedagogy is education as a special, socially and personally determined activity of introducing a person to life in society, which is characterised by pedagogical goal-setting and pedagogical guidance…"; "Education is the process and result of an individual's acquisition of a certain system of scientific knowledge, practical skills and abilities, and the associated level of development of their intellectual-cognitive and creative activity, as well as moral and aesthetic culture, which together determine the social face and individual uniqueness of this person… The concept of "Education" should be considered as a process of external influence on the individual's assimilation of generalised, objective, social experience, norms, values, etc…" (Kremen, 2008; Kremen *et al.*, 2021).

The Encyclopaedia of Education is aptly described as a "reference-analytical work" (Kremen, 2008). The terms "analytical" and "multidisciplinary" are closely related, as they explicitly highlight the inclusion of "information from related fields that are significant for the development of contemporary education" (Kremen, 2008; Kremen *et al.*, 2021). Overall, it is a multidisciplinary and personal publication, with entries representing the denotative substances of the theory, history, and practice of Ukrainian education, the terminological and conceptual foundations of pedagogical science, contemporary educational paradigms and concepts, as well as biographical information about educators and public figures who have influenced the development of national education. A notable feature of this encyclopaedia is the structure of its entries, which, with their detailed content and verbal organisation, more closely resemble in-depth scholarly entries than concise, standardised encyclopaedia entries. Almost all entries include a bibliography. The first and second editions have undergone significant changes, including alterations in the editorial board and the author collective (for example, the inclusion or exclusion of controversial figures like D. Tabachnyk and A. Tolstoukhov), as well as changes in the number of entries and their content. The second edition features the following notable changes: 1) the addition of new entries, 2) the removal of certain entries, and 3) the reworking of existing entries under different authorship and based on different principles.

There are also discrepancies in the quantity, and to some extent, the quality of entries between the two editions. Over the ten-year period between the publications, the field of education underwent significant changes, as evidenced by the entries beginning with the letter "A" (English: A). For instance, in 2008 35 entries started with "A", while in 2021, this number increased to 78. The majority of these new entries reflect innovative processes in education and its modernisation in response to contemporary challenges. Examples include "Institutional autonomy in higher education", "Academic autonomy of general secondary education institutions", "Academic year", "Academic integrity", "Academic mobility", "Academic freedom", "Academic plagiarism", "Academic ranking of universities, or 'Shanghai' ranking", "UNESCO Associated School", "Alternative learning", "Teaching assistant" and others. Conversely, some entries from the 2008 edition were either omitted or modified in the 2021 edition due to changes in their relevance or the need for more specific or detailed information. For example, the entry

"Accreditation" (→ "Accreditation Commission of Ukraine", "Institutional accreditation", "Accreditation of educational programmes"), "Teacher certification", "Certification of pedagogical, scientific-pedagogical and scientific staff" (→ "Certification of a researcher", "Certification of a pedagogical worker"). Another process observed is the integration of entries primarily relating to established, clearly defined terms and concepts: "Adaptation" (← "Child adaptation to school", "Professional adaptation"), or the removal of entries that are indirectly related to the field of pedagogy and education: "Academy of Medical Sciences of Ukraine (AMS of Ukraine)", "Academy of Arts of Ukraine (AA of Ukraine)". The list of notable figures has been significantly reduced, those who "represent and today define the face and authority" of science: from 132 in 2008 to 61 in 2021 (Karpilovska & Ziabliuk, 2009). Notable figures from other fields, such as the historian and composer M. Arkas, linguists L. Bulakhovskyi and O. Potebnia, and literary critic S. Yefremov, were not included in the newer edition. Similarly, ideologically charged figures like O. Mazurkevych, N. Krupskaya, and L. Tolstoy were omitted. The newer edition includes entries on prominent contemporary Ukrainian educators, including S. Honcharenko and M. Yarmachenko, who were instrumental in creating the encyclopaedia. Notably, their entries in the encyclopaedia itself represent a deeper, more nuanced, and historically contextualised analysis of their contributions compared to the earlier definitions provided in their own works.

"The stated intention in the first edition of the Encyclopaedia of Education to "continue working on the creation of encyclopaedic literature" has been partially realised. However, the authors acknowledge that the new edition cannot be considered "exhaustive, since the field of education is extremely broad and diverse" and is also as well as dynamic" (Kremen, 2008). The evolutionary processes occurring in science and society necessitate the periodic revision of encyclopaedic works. Such publications serve as a reflection of a nation's development, its standing in the global intellectual and civilisational landscape, and its ability to respond to contemporary challenges and future aspirations.

The Ukrainian Pedagogical Encyclopaedic Dictionary by S. Honcharenko (2011), produced by the State Scientific Institution "Encyclopaedic Publishing", outlines the future prospects for encyclopaedisation of education. Its primary objective is to "define the place of pedagogical knowledge in the Great Universal Encyclopaedia… to facilitate a comprehensive understanding of the specified segment and to better orientate the authors of future entries, as well as to stimulate scientific discussion, debate, and critique of the proposed entries in the dictionary". Within the field of Pedagogical Sciences, a "family tree of concepts" has been developed in the form of a thematic register of terms, represented by specific groups of word-designations of scientific denotations, which, according to the authors of the analysed publication, "represent the pedagogical field in a conceptual-categorical paradigm" (Kyrydon, 2020). The implementation of this project will not only contribute to a deeper understanding and more qualified interpretation of the pedagogical and educational essence of terms and concepts but will also clarify the place of Ukrainian pedagogy and education in the European and global historical-pedagogical process, with its rational-constructive and opposing tendencies.

Conclusions

The development of pedagogical and educational terminology, a crucial component of any society's knowledge base, has a long and complex history in Ukraine. Shaped by the country's unique sociopolitical circumstances, this process experienced a significant resurgence following the renaissance of the Ukrainian language in the 1920s. The period of independence witnessed a particularly intense period of development, building upon centuries-old traditions of forming terminological and conceptual apparatus with a

strong emphasis on native Ukrainian terms. The publications produced during this period exhibit a wide range of encyclopaedic characteristics, varying in genre, target audience, and internal structure. Based on the criterion of "nature of information", three primary models of encyclopaedic publications can be identified: specialised pedagogical encyclopaedias of pedagogical terms, specialised regional-personal publications, and pedagogical encyclopaedias. Each of these models is represented by a variety of individual or collective editions.

A comprehensive analysis of specific representatives of the third model, using a synchronic and diachronic approach, reveals that works such as the Ukrainian Pedagogical Dictionary and Ukrainian Pedagogical Encyclopaedic Dictionary by S. Honcharenko, the Pedagogical Dictionary edited by M. Yarmachenko, and the Encyclopaedia of Education (2008 and 2021) stand out for their substantial content, depth of interpretation, and sophisticated structure. Each of these works possesses unique characteristics in terms of the scope of information, the structure of entries, definitional norms, criteria for selecting personalities, and the presentation of scientific biographies. Moreover, they demonstrate a wide range of criteria for interpreting pedagogical and educational terms and concepts, including theoretical, applied, universal, prospective, national, specialised, sectoral, regional, retrospective, modern, rational-constructive, critical, comparative, and other research aspects. These publications consistently adhere to encyclopaedic standards while simultaneously reflecting a national perspective and aligning with global standards. Ukraine can further strengthen its position in the international academic community by developing a comprehensive Great Universal Encyclopaedia that includes a dedicated section on Pedagogical Sciences. The Great Encyclopaedia. Thematic Register of Slogans in the Field of Pedagogical Sciences is viewed as a strategic step towards this goal, contributing to Ukraine's national self-asertion and integration into the European and global community.

Future research should focus on a systematic analysis of both classical and syncretic works, comparing them to other information sources commonly used in contemporary educational and academic contexts, such as specialised pedagogical encyclopaedias of pedagogical terms and specialised regional-personal publications. Urgent tasks include the preparation of encyclopaedic studies that reflect innovative processes in pedagogy and education. These studies should also mirror the maturity of society and its level of intellectual development.

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Conflict of Interest

None.

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Енциклопедія української освіти доби незалежності: тезаурус теорії, практики, персоналій

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Анотація. Актуальність праці зумовлена потребою цілісного дослідження термінологійно-поняттєвого апарату педагогіки на засадах класичної та модерної енциклопедистики. Метою статті був комплексний аналіз сучасних найавторитетніших із погляду енциклопедичного стандарту, змістової структури, україноцентричності й зорієнтованості на європейські традиції енциклопедичних видань. Використано адекватні теоретичні, емпірійно-теоретичні, емпірійні методи з метою ґрунтовного вивчення корпусу педагогічних знань крізь призму термінологійно-поняттєвого апарату та прецедентних особистостей із наданням переваги методам аналізу дефініцій і контент-аналізу, порівняльно-зіставному та класифікаційному методам. Різновекторно проаналізовано процес номінування, лексикографування, термінографування наукових денотатів з інтегрувальним критерієм «педагогічні, освітні реалії». Об'єктом дослідження обрано етапні

енциклопедійні видання чітко окресленого хронологійного зрізу – кінець XX – початок XXI ст. (доба незалежності), а предметом – «Педагогічний словник», «Педагогічний енциклопедичний словник» С. Гончаренка, «Педагогічний словник» за ред. М. Ярмаченка, першу й другу редакції колективного видання Національної академії наук України «Енциклопедія освіти», макет «Великої енциклопедії. Тематичного реєстру гасел з напряму "Педагогічні науки"», що програмує через змістово-інформативний контент «родовідне дерево понять» у вигляді тематичних груп як репрезентантів напряму «Педагогічні знання» у «Великій універсальній енциклопедії». Зроблено спробу класифікування досліджуваного енциклопедійного контенту з виокремленням найтиповіших моделей з об'єднувальними маркерами «спеціалізоване видання», «регіональне видання», «персональне видання», «власне енциклопедійне видання». Дослідження здійснено крізь синхронійно-діахронійну призму з акцентуванням на компендіумі знань про культивовану педагогічну, освітню термінологію та знакові персоналії, які представляють у різних вимірах сферу педагогіки й освіти. Докладно проінтерпретовано специфіку реєстру вирізнених праць, дефінітивні стандарти гасел, їхні релевантні характеристики у проєкції на гармонійний синтез енциклопедійного універсалізму та ідіостильових особливостей конкретно взятого видання і сукупного контексту. Застосовано порівняльний аналіз видань з метою комплексної характеристики динамічних процесів у педагогічній, освітній термінологійно-поняттєвій системі на тлі національного та світового наукового й історико-культурного поступу. Результати дослідження можуть бути застосовані в енциклопедографії, термінографії, практиці викладання предметів педагогічного циклу

Ключові слова: освітня сфера; педагогічні енциклопедійні видання; термінологійно-поняттєвий апарат; педагогічний словник; педагогічні науки

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Innovations in ESP teaching and learning practices

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Abstract. The informatisation of society and the rapid development of technology significantly outpaces its implementation, including in education. The use of the latest technologies reduces the dependence of teaching and learning on students' physical location, enhances the structure and content of the educational process, and improves its efficiency, personalisation and student engagement. Artificial intelligence tools facilitate more effective information presentation and assimilation. This research aimed to examine how technologies can be implemented in education to enhance efficiency and student-centred learning. This article presented experiences in using technologies for teaching English for Specific Purposes, with a particular focus on the application of artificial intelligence and the Internet of Things. Their role in increasing student motivation and ensuring that the educational process remains aligned with current trends was explored. Theoretical research methods, including analysis, synthesis, comparison, generalisation, and concretisation, alongside scientific methods such as chronological analysis and cause and-effect examination, enabled an investigation of the challenges associated with integrating emerging technologies into education. The current state of the problem, along with the benefits and challenges of using innovations in education, was analysed through content analysis. This article compared the definitions of artificial intelligence and highlighted its transformative potential in personalised learning. Key applications of AI in education, including natural language processing (NLP) and chatbots, which enhance learning experiences, were examined. Ethical considerations regarding AI usage in education were also discussed. The advantages of using AI-powered learning platforms for both students and teachers were explored. Particular attention was to AI's ability to analyse students' strengths, weaknesses, and preferences, ensuring that content is relevant and appropriately challenging for each individual. Continuous evaluation adjusts question difficulty based on student performance, ensuring they are challenged without being overwhelmed. Instant feedback enables students to identify mistakes immediately, which fosters rapid learning and improvement. Solutions to identified challenges were suggested

Keywords: artificial intelligence; Internet of Things; English for Specific Purposes; ethical principles; educational AI

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Introduction

Language learning was once a tedious process, involving the memorisation of long vocabulary lists, learning grammar rules, and completing numerous monotonous exercises. Technology is making English for Specific Purposes (ESP) teaching and learning increasingly engaging and enjoyable. While technology is no longer a novelty, it continues to astonish with its limitless potential. Technological advancements are occurring at such a rapid pace that the primary challenge lies not in a lack of tools or resources for improving the educational system but in the difficulty of keeping up with constant innovations. Despite extensive research in the field, ongoing attention is required.

The field of ESP has evolved significantly in recent years, adapting to the changing demands of global communication, technological advancements, and the increasing specialisation of various professional domains. Innovations in ESP teaching and learning are essential for preparing students to navigate both academic and professional challenges. The following studies reflect the latest developments in this field. H. Basturkmen (2022) examines the transition from traditional models to more dynamic, learner-centred approaches, particularly in blended and online learning environments. He underscores the importance of aligning English courses with professional linguistic and communicative requirements. Furthermore, his research explores how ESP fosters critical thinking and problem-solving through task-based learning.

R. Candrasari *et al.* (2024), investigating the potential benefits of innovative methodologies in ESP teaching, argue that educators can create dynamic and interactive learning environments to enhance student motivation and participation. This is achieved through the integration of the latest technologies, including virtual reality simulations and gamified learning platforms, which cultivate critical thinking and adaptability. J. Tang (2023) explores the ways to build "Artificial Intelligence English for Specific Purposes (AI ESP)". He differentiates between academic and professional needs and identifies how information technology should be integrated into ESP teaching and which tools should be utilised. His research highlights the necessity of teacher development support to enhance educators' proficiency in AI-driven ESP instruction.

O. Melnychuk *et al.* (2024) highlight "the key reasons why using mobile apps for learning English is considered topical: accessibility, convenience, interactive and engaging content, personalised learning, variety of learning materials, social and community features, progress tracking". D. Milosevic (2023) examines the use of information technologies, particularly the Internet of Things (IoT), in teaching a foreign language to IT students. As IoT continues to evolve and become more prevalent worldwide, the author emphasises the importance of gathering data in this field. Given that IoT is studied by IT students, its integration into foreign language classes is inevitable, aligning with the programme curriculum. ESP teachers often struggle to stay up to date with contemporary technologies and integrate ongoing innovations into their teaching methods. This challenge is particularly pronounced when they lack professional expertise in these and related fields, making it difficult to effectively communicate technical content to students, who have high expectations regarding their lecturers' technical and digital literacy. These studies demonstrate that innovations in ESP teaching practices focus on adapting to the specific needs of different professional fields while also embracing technological advances, learner-centred pedagogies, and interdisciplinary approaches. Although common themes exist – such as task-based learning, communicative competence, and technology integration – each study offers distinct insights and practical applications within diverse ESP contexts, thereby making valuable contributions to the field.

This research aimed to explore how technologies can be implemented in education to enhance efficiency and improve student engagement.

As a result of this study, the article sought to share the substantial insights gained throughout the research process. The article primarily examined the use of artificial intelligence and the Internet of Things in education, as well as their application in ESP teaching, and learning to increase student motivation and optimise the learning process. Achieving the aim of the research involved the following objectives:

- to examine how artificial intelligence and the Internet of Things can be applied in education;
- to analyse existing definitions of the terms "artificial intelligence" and "Internet of Things";
- to investigate which online resources can be effectively used in ESP training;
- to provide examples of the latest technologies used in ESP teaching and learning.

Materials and Methods

The research on innovations in English for Specific Purposes (ESP) teaching and learning employed a combination of theoretical and applied methods to explore how advanced technologies can transform educational processes. Theoretical methods, such as analysis, synthesis, comparison, generalisation, and concretisation, enabled the formulation of initial provisions and the identification of the study's key ideas. The research integrated existing literature and case studies to understand the transformative potential of technology in ESP teaching. Scientific methods, namely chronological and cause-and-effect analysis, facilitated the examination of challenges associated with integrating the latest technologies into educational practices. Using content analysis, the study characterised the current state of the issue, identifying both the advantages and challenges of AI implementation in education. Surveys and questionnaires are widely recognised as cost-effective tools for collecting diverse opinions and experiences, offering insights into the practicalities of implementing innovations in ESP teaching. In this study, no original surveys were conducted; instead the research drew upon the findings of other scholars (Candrasari *et al.*, 2024; Nikolić *et al.*, 2024). Their surveys investigated teachers' and students' perceptions of innovative practices as well as their attitudes towards new teaching tools and methods.

To illustrate the ethical principles of artificial intelligence usage, a graphical method was employed. A tabular method was applied to construct tables, while dimensional analysis provided a comprehensive perspective on the phenomenon under study. Additionally, analytical and interpretative methods were used to examine the definitions of "artificial intelligence" and "Internet of Things" in academic literature. At one stage, the comparative method was used to evaluate and contrast various internet resources for their effectiveness in ESP teaching. Systematisation and generalisation contributed to the formulation of the study's conclusions. Ethical challenges associated with AI adoption in education, such as data privacy concerns and potential biases in AI algorithms, were critically examined. The research underscored the importance of responsible AI implementation in fostering trust and inclusivity. By integrating these methods, the study provided a comprehensive understanding of how innovative technologies can enhance ESP education, optimising its efficiency and aligning it more closely with students' needs.

Results and Discussion

Artificial intelligence in education and its definition

To better understand how AI can be used in the educational process, its various definitions have been examined. Despite the existence of numerous definitions, studies by the Netherlands Council for Government Policy indicate that there is no universally accepted definition of the AI concept (Sheikh *et al.*, 2023). The term "artificial intelligence" was first mentioned in the 1950s. Later, D. Dobrev (2013) and J. Schuett (2019) presented three of the most widely recognised definitions: (1) "Artificial intelligence means any computer that passes the Turing test" (based on Alan Turing's test); (2) "Artificial intelligence means the

science and engineering of making intelligent machines" (John McCarthy) – this definition does not reference human intelligence; and (3) "Artificial intelligence means an intelligent agent" (definition by Stuart Russell and Peter Norvig). L. Chen *et al.* (2020) define artificial intelligence as "a field of study and the resulting innovations and developments that have culminated in computers, machines, and other artefacts having human-like intelligence characterised by cognitive abilities, learning, adaptability, and decision-making capabilities".

Artificial intelligence (AI) has the potential to significantly transform teaching and learning processes (Derevyanko & Zalevska, 2023). These processes are becoming increasingly personalised due to the AI algorithms that analyse data, identify patterns, and make predictions (Harry & Sayudin, 2023; Kamalov *et al.*, 2023; Su & Yang, 2023). Students have already benefited from the ability to learn at their own pace and in a way that best suits their learning style, while teachers save time through intelligent learning and tutoring systems, automated assessment systems, Personal Learning Environments (PLEs), Learning Management Systems (LMS), and a diverse range of teaching resources. M. Nikolić *et al.* (2024) argue that speaking and listening skills experience the most significant improvements through the use of information and communication technology. M. Waugh *et al.* (2021) conducted content analysis to examine how textbooks and teaching materials incorporate new approaches to language teaching. The authors assert that content analysis of ESP materials determines the extent to which innovations, such as task-based learning or the integration of professional jargon, are embedded within the materials used by teachers and students.

Natural Language Processing (NLP) is one of the primary applications of AI. It enables intelligent systems to understand and process human speech and text. J. Su & W. Yang (2023) examined the potential advantages and disadvantages of using ChatGPT in education and referred to it as "educative AI". They define ChatGPT as "a form of generative AI that uses algorithms to generate new text similar to what a human might write. It is a language model that uses deep learning to generate human-like responses to natural language queries. ChatGPT is designed to be used in a conversational setting, allowing users to interact with the model naturally and intuitively. As a powerful AI application, ChatGPT can answer questions, write stories, summarise documents, and compose essays". Chatbots are also increasingly used in education to enhance students' learning experiences and facilitate their learning (Wollny *et al.*, 2021).

M. Sharples (2023) concludes that "building social generative AI for education will require the development of powerful AI systems that can converse with each other as well as humans, construct external representations such as knowledge maps, access and contribute to internet resources, and act as teachers, learners, guides and mentors". With the emergence of AI in education, issues such as security, data privacy, teacher-student relationships, and ethics have come to the forefront. Extensive research is being conducted on the ethical implications of AI in education, as these concerns continue to generate widespread discussion. Ethical considerations must be addressed when designing and implementing trusted AI systems for education. A. Nguyen *et al.* (2023) propose a set of ethical principles (Fig. 1). The authors state that "no universal consensus has been reached on the best ethical theory in general". In 2024, UNESCO introduced two new AI competency frameworks: one for students, developed by F. Miao & K. Shiohira (2024), and another for teachers, developed by F. Miao & M. Cukurova (2024). The AI competency framework for teachers is designed to assist educators in implementing artificial intelligence "responsibly and thoughtfully, ensuring that AI contributes positively to society and the environment" (UNESCO, 2024). Thus, AI enhances education by making it more effective, inclusive, and engaging, while also preparing students for a world driven by technology.

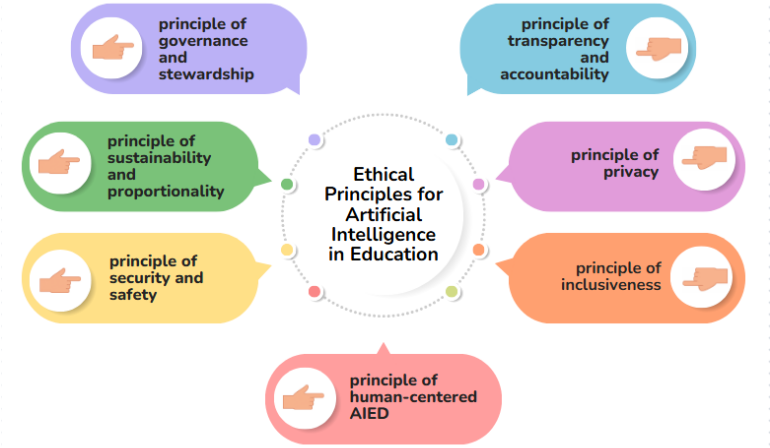

Figure 1. *Ethical principles for artificial intelligence in education*

Source: *developed by the author based on the research by A. Nguyen et al. (2023)*

Internet of Things technologies in education

The application of Internet of Things technologies in education aims to simplify teaching and learning processes while also improving the quality and enhancing the efficiency of educational systems. Discussions regarding the use of IoT in education remain ongoing. Researchers such as T. Todorov & P. Vela (2023), and A. Mohanty *et al.* (2023) highlight various advantages and disadvantages of its application. Table 1 presents some typical benefits, challenges, and possible solutions identified in different studies.

Table 1. *Benefits and challenges of the Internet of Things in education*

Benefits	Challenges	Proposed solutions
➤ facilitates communication between learners and teachers worldwide; ➤ reduces gender inequality; ➤ enhances students' engagement and trainers' effectiveness; ➤ promotes teamwork and creative thinking; ➤ provides better access to data; ➤ enhances safety; ➤ optimises the training process; ➤ contributes to efficient lesson planning; ➤ enables unprecedented real-time data collection.	➤ lack of financial resources; ➤ ethical challenges; ➤ unlawful access; ➤ privacy and data security concerns; ➤ difficulties in maintaining smooth functionality; ➤ limited availability of computers and equipment; ➤ harmful environmental impacts; ➤ utilisation of limited global resources; ➤ high energy consumption associated with the production of electronic devices; ➤ insufficient research on sustainability and long-term effects.	➤ setting strict security standards; ➤ investing in teacher training; ➤ monitoring and evaluating rapid technological development from an environmental perspective; ➤ ensuring responsible utilisation of limited global resources; ➤ careful investigation of potential environmental footprints; ➤ improving recycling rates; ➤ managing secure e-waste.

Source: *developed by the author based on the research by M. Safdar et al. (2019)*

S. Al-Taai *et al.* (2023) identify "smart education, smart classes, proof of attendance, text message alerts, emergency management in educational institutions, improving operational

efficiency in educational institutions, educational applications" as the most significant IoT applications in education. These applications "relying on electronic devices, equipment, and software, including smartphones, handheld devices, smart boards, electronic classes, and high-definition television". The authors assert that IoT helps students "to overcome the barriers of time and space and enables them to successfully control the learning management from a distance". Unfortunately, the Internet of Things has yet to be fully integrated into traditional education (Badshah *et al.*, 2023). The following section outlines some examples of tools that leverage the extensive capabilities of artificial intelligence.

One of the AI-driven differentiation tools that can transform AI-generated content into different formats is Diffit. It provides teachers with quickly generated resources. Diffit creates customised resources for ESP lessons, saving time and ensuring that all students can access content appropriate to their level. It can generate or adapt texts for any reading level, provide teachers and students with automatically generated summaries and comprehension exercises, extract vocabulary from any context, edit texts of varying complexity, create discussion questions, dialogues, and letters, identify quotes for any topic, and build a wide range of exercises. The self-paced course helps teachers learn how to use this versatile tool. Another similar, and even more popular, AI-powered tool for English teachers is Twee. Figure 2 illustrates the extent to which AI tools can support teachers' work and enhance teaching efficiency (Twee, n.d.).

Figure 2. *Capabilities of AI tools*

Source: *developed by the author using Twee.com education technology (Twee, n.d.)*

AI-powered mobile applications are transforming ESP training by providing personalised and interactive learning experiences. These tools leverage cutting-edge technologies to cater to the unique needs of learners in various professional fields. AI algorithms analyse individual learning styles, strengths, and weaknesses, allowing for tailored content and practice exercises that align with each learner's needs. Through real-time feedback, mobile applications provide instant assessments and corrections to help learners understand their mistakes and improve their speaking skills efficiently. Interactive features such as gamification, chatbots, and speech recognition keep learners motivated and engaged, making the learning process more effective and enjoyable. AI tools simulate real-world scenarios relevant to specific industries, allowing learners to practice language skills in context. They provide flexibility and convenience for learners with demanding schedules. Task examples are presented in Table 2.

Table 2. *AI-based English learning tools*

Answering questions about yourself	**Reading aloud**	**Giving opinion**
You will hear 8 questions. Listen to each question, then answer. For questions 1-4, you have 10 seconds to respond. For questions 5-8, you have 20 seconds.	You will see 8 sentences. You have 10 seconds to read and record each sentence.	You have 1 minute to talk about a topic. First, read the task and prepare your answer. Then, speak for one minute.
Giving a presentation about a graphic	**Give advice or make a recommendation**	**Answer questions about a topic**
You have 1 minute to discuss a visual representation of data. First, examine the information and prepare your response. Then, speak for 1 minute while continuing to view the graphic.	You will hear five questions about a topic. First, read the task. Listen to each question, then respond. You should speak for 20 seconds.	You have 1 minute to talk about a visual representation of data. First, examine the information and prepare your response. Then, speak for 1 minute while continuing to view the graphic.

Source: *Developed by the author using Course Hero education technology*

Therefore, it can be concluded that the Internet of Things in education connects devices and systems to enhance learning environments and improve educational outcomes. By integrating IoT, education becomes more intelligent, efficient, and accessible, empowering both teachers and students.

Artificial intelligence-powered learning platforms

Generative AI-driven tools aim to improve students' speaking skills. One such tool is Speak & Improve (similar to Write & Improve) from the University of Cambridge (Speak & Improve, n.d.). Developed as a research project by the University of Cambridge, it evaluates students' speaking skills in an online environment. Students can practice their speaking skills with a speech robot that listens to them and assesses their pronunciation, reading, ability to express their point of view, give advice or make a recommendation, describe a graphic, and answer questions. Accurate grading based on the internationally recognised CEFR scale serves as a powerful motivational tool. The exercises can be completed separately or as part of a full test, which is particularly useful for exam preparation. The test consists of five parts:

- Part 1: Answer questions about yourself;
- Part 2: Read aloud;
- Part 3: Give a presentation on a personal topic;
- Part 4: Give advice or make a recommendation;
- Part 5: Answer questions about a topic.

A notable aspect of Speak & Improve is that, unlike Write & Improve, it is not yet officially a product, meaning it is currently available for free. The developers state that they need learners' recordings to improve the tool itself. Thus, it serves

as a free alternative to ELSA Speak, which provides voiceenabled role-play, realistic speaking practice, a "Create Your Own Scenario" feature, a wide range of lessons on different skills and topics, daily recommended practice, progress tracking and rewards, and access to certificate courses (IELTS, Oxford, HarperCollins, EIKEN, and Pearson PTE), as well as the US Citizenship Test Preparation Course. The most noteworthy feature is the AI-generated feedback on fluency, grammar, and vocabulary, along with guided practice for interviews, presentations, and exams. Additional features such as a dynamic transcript, paraphrasing tool, and vocabulary recommendations enhance the learning experience (ELSA, n.d.).

The term "burstiness" refers to "the phenomenon where language learners repeatedly come across unfamiliar words" (Talkpal, 2024). AI facilitates language learning by tracking progress, identifying learning patterns, and potential challenges. Recently, numerous chatbots have emerged to help students enhance their speaking, listening, and pronunciation skills through voice interaction with AI that speaks English in a natural, human-like manner. Another AI-powered innovation is learning platforms such as Coursera, edX, Knewton, Duolingo, Smart Sparrow, and DreamBox. These platforms are popular as they leverage artificial intelligence to create personalised, efficient, and engaging learning experiences. The benefits of their use in education are widely discussed. Advanced technologies enable adaptation to individual students' needs, making education more accessible and effective. AI analyses learners' strengths, weaknesses, and preferences, ensuring that content is relevant and appropriately challenging for each student. Continuous evaluation adjusts the difficulty level of questions based on the student's performance, ensuring that they are challenged but not overwhelmed, while instant feedback helps them identify their mistakes immediately. This process fosters quick learning and improvement.

Multimedia content, simulations, and games motivate students to learn languages. The 24/7 availability of resources and support enables students to study at their own pace and fit learning into their schedules. Teachers, in turn, benefit from AI platforms because automating assessment and analytics allows them to focus more on instruction than administrative tasks. AI platforms help teachers refine their methodology and curricula by collecting and analysing data on learners' progress and engagement.

Another technology worth mentioning is augmented reality (AR) glasses, which help international students overcome challenges associated with language barriers and enhance their translation experiences. S. Chen's (2024) research shows that AR technology facilitates the integration of international students into non-native learning environments. In 2022, Google announced AI-powered glasses capable of translating speech on the device's display in real time. The Google Translate glasses can even detect American Sign Language, and project a translation in front of a user's eyes like real-time subtitles. While the glasses remain in the prototype phase, and the company has not provided any information on their potential commercial release, they are expected to indicate the direction of the AR device market. Alphabet's first Google Glasses faced backlash due to an integrated camera that raised privacy concerns. The design of the new translation glasses has been modified from a more sci-fi look to a traditional glasses design, demonstrating how groundbreaking innovations quickly transition from novelty to familiarity. Thus, educational platforms are increasingly becoming AI-driven. They revolutionise education by offering personalised, efficient, and engaging learning experiences, empowering both educators and learners, and making education more inclusive, adaptive, and future-ready.

Conclusions

The research conducted underscores the transformative potential of innovations, particularly artificial intelligence and the Internet of Things, in enhancing ESP teaching and learning. The

findings highlight how AI-powered tools and IoT systems can create engaging, efficient, and personalised educational experiences, effectively addressing the challenges traditionally associated with language education. AI technologies, such as intelligent tutoring systems, automated assessment tools, and natural language processing applications, have demonstrated their capacity to adapt to individual learners' needs. These innovations not only facilitate tailored learning paths but also enable teachers to refine their instructional methods. Similarly, IoT technologies have shown promise in fostering smart learning environments through enhanced connectivity and real-time data collection. These advancements have been instrumental in improving student engagement, collaboration, and access to educational resources.

Moreover, the research identifies several advantages of incorporating these technologies into the ESP domain, including fostering learner autonomy, streamlining administrative processes, and bridging gaps in accessibility. However, it also identified areas requiring further attention, such as the ethical implications of AI in education, privacy concerns, and the environmental impact of IoT systems. The study's findings align with its objectives and purpose, offering valuable insights into the practical applications of AI and IoT in ESP education. These insights contribute to the broader discourse on integrating technology into educational systems, emphasising the need for thoughtful and responsible implementation strategies. Future research should focus on addressing the identified challenges, particularly by exploring sustainable practices for implementing IoT in education and developing ethical frameworks for AI use. Additionally, further studies on the long-term impact of these technologies on learner outcomes and teacher efficacy would offer deeper insights, ensuring their responsible and effective integration into the educational landscape.

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None.

Conflict of Interest

None.

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Інновації в практиці викладання та навчання англійської мови професійного спрямування

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Анотація. Інформатизація суспільства та темпи розвитку технологій значно випереджають темпи їх впровадження, зокрема в освіту. Застосування новітніх технологій зменшує залежність викладання та навчання від місця розташування студентів, сприяє вдосконаленню форм і змісту навчального процесу, його ефективності та індивідуалізації, а також залученості та мотивації студентів. Засоби штучного інтелекту сприяють кращому представленню та кращому засвоєнню інформації. Дослідження мало на меті пошуки шляхів впровадження новітніх технологій в освітній процес задля підвищення його ефективності. Стаття висвітлила досвід використання новітніх технологій у процесі викладання англійської мови професійного спрямування. Особливу увагу приділено використанню штучного інтелекту та Інтернету речей в освіті та їх застосуванню у викладанні англійської мови професійного спрямування для підвищення мотивації до навчання та адаптації освітнього процесу до сучасних тенденцій. Теоретичні методи дослідження, такі як аналіз, синтез, порівняння, узагальнення, конкретизація, а також наукові методи, а саме хронологічний та причинно-наслідковий аналіз, дозволили вивчити проблеми використання новітніх технологій у навчальному процесі. Сучасний стан проблеми, позитивні аспекти та виклики, пов'язані з використанням інновацій в освіті, були досліджені за допомогою методів контент-аналізу. У статті порівняно визначення штучного інтелекту та висвітлено його трансформаційний потенціал у персоналізації навчання. Було вивчено ключові застосування штучного інтелекту в освіті, включаючи обробку природної мови (NLP) і чат-ботів, які покращують навчальний досвід. Також були розглянуті етичні міркування щодо використання ШІ в освіті. У статті обговорювались переваги використання навчальних платформ на основі ШІ для студентів і викладачів. Увагу приділено здатності штучного інтелекту аналізувати сильні й слабкі сторони та вподобання студентів, щоб переконатися, що рівень контенту є відповідним і достатньо складним для кожного з них. Безперервне оцінювання регулює рівень складності запитань залежно від результатів учня, гарантуючи, що вони будуть залучені, але не перевантажені. Миттєвий зворотний зв'язок допомагає учням негайно виявити свої помилки, що сприяє швидкому навчанню та вдосконаленню. Запропоновано шляхи вирішення проблем

Ключові слова: штучний інтелект; Інтернет речей; ESP; етичні принципи; навчальний ШІ

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Training of future engineering specialists in vocational education institutions in China

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Abstract. High-quality engineering education is a key driver of technological leadership and economic development in leading countries worldwide, including China. The study analysed contemporary approaches to the innovative development of engineering education, addressing adaptation to the challenges of the new economy. The dual education initiative, which integrates theoretical learning with practical experience, was emphasised. This approach aims to train highly qualified engineers capable of meeting the demands of innovative development and implementing groundbreaking solutions. The study aimed to identify the pedagogical conditions and specific features of training future engineers in China's vocational education institutions. Methods of analysis, synthesis, and generalisation were employed to systematise the findings. The study highlighted key issues in professional training, including passive learning processes, limited opportunities for intercultural communication, and insufficient integration of project-based learning. The role of collaboration with enterprises in development of practical skills among students was emphasised. The study identified essential pedagogical conditions that contribute to effective training of engineering personnel: the use of modular learning, the implementation of information and communication technologies, a focus on independent learning, and the expansion of practical training opportunities. The prospects for an interdisciplinary approach in curricula were discussed, emphasising its role in fostering creative and critical thinking. The study demonstrated that engaging international partners in the educational process can significantly enhance education quality. The practical significance of the study is determined by underlining of ways to improve the training of engineers in vocational colleges. The findings can be utilised to develop educational programs that integrate theory with practice, enhancing the competitiveness of graduates in the international labour market

Keywords: engineers; dual education; vocational colleges; technical education; project-based learning

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Introduction

Engineering potential forms the foundation of economic success and technological leadership in the modern world. China demonstrates a strategic approach to developing vocational education, particularly in engineering training, which underpins its leading role in the global economy. However, the country's educational system faces significant challenges, including a passive approach to learning, insufficient implementation of active methodologies such as project-based learning, and limited opportunities for intercultural communication. These issues hinder the development of critical and innovative thinking, which are essential for modern engineers (Liu *et al.*, 2023). In the context of the identified problems, it is necessary to supplement them with such problems as the lack of legislative regulation of the rights and obligations of enterprises and colleges in the process of training future engineers and the low level of the image of vocational and technical education.

T. Hao & M. Pilz (2021) noted the positive impact of international educational exchanges and collaboration with enterprises in enhancing students' practical skills and intercultural competence. The authors explored the international cooperation of Chinese technical colleges with colleges and enterprises in other countries. Their proposed international exchange plan includes both the "import" and "export" of resources. The authors emphasise that vocational colleges should integrate advanced educational resources, high-level engineering knowledge borrowed from foreign vocational colleges, actively organise student participation in international exchanges and overseas internships, and support Sino-foreign cooperative projects related to engineering education.

A study by F. Wang (2020) underscores the need to reform curricula by incorporating problem-oriented and experimental methods. The author suggests that vocational colleges should review their educational methodologies, update course content, and focus on implementing problem-based, project-based, case-based, and research-oriented teaching methods. In addition to fundamental technical knowledge and skills, interdisciplinary knowledge should be emphasised. Moreover, interaction between instructors and students should be further promoted and evaluation methods should be reformed to ensure a student-centred engineering education model. The author considers the above recommendations for expanding cooperation between enterprises and colleges, introducing innovative methods and learning tools to be the main issues on which both participants in the educational process and the government, business circles, and scientists should focus their attention.

According to M. Barak *et al.* (2024), integration of natural sciences and mathematics into the methodology of practical tasks should be a core principle of engineering education. Therefore, engineering students should acquire knowledge both passively and actively to solve real-world practical problems in the future. Additionally, R. Neves *et al.* (2021) emphasised that engineering education and active learning are intrinsically linked. Furthermore, the U.S. National Science Foundation highlighted that engineering education should encourage close interaction with industry and incorporate project-based learning (PBL) pedagogies (Liu *et al.*, 2023). Actively acquisition of knowledge will contribute to professional development, but the use of natural sciences in methodology as a main principle is an exaggeration. In terms of collaboration between vocational colleges and enterprises, H. Guo & M. Pilz (2020) advocated for providing on-site practical opportunities for students, suggesting "approximately a year of training in a corporate environment". During the implementation of training programs, enterprises assign engineers as instructors to oversee student participation in research projects. Companies collaborating with vocational colleges are expected to engage in the talent training process and establish joint mechanisms that encompass curriculum design, shared objectives, course

content, implementation procedures, and quality assessment systems (Fedoreiko *et al.*, 2022).

A review of relevant studies revealed that the development of professional skills among future specialists in engineering fields at vocational colleges in China remains insufficiently explored. Existing research often focuses on the cultural and national characteristics of China's vocational education system, narrowing other educational contexts, including the technical aspects of Chinese vocational education. Analysis of current teaching methodologies in vocational colleges and the lack of practical frameworks has made it difficult for researchers to identify best practices for training future engineers under the dual education system. The study aimed to identify pedagogical conditions that enhance the quality of training future engineers in China's vocational education institutions. The main objectives were to analyse key issues in contemporary engineering education, examine existing approaches to addressing these challenges, and develop recommendations for improving educational programs. The scientific novelty of this work lies in identifying practical mechanisms for implementing dual education, which ensures an effective combination of theory and practice. The study's findings were aimed at improving curricula through the integration of innovative pedagogical methods, including modular and interdisciplinary learning, as well as fostering collaboration between colleges and enterprises.

Materials and Methods

To achieve the objectives of this study, several sequential stages were carried out to examine the challenges and specific features of training engineering personnel in Chinese vocational education institutions. The applied methods allowed for obtaining new scientific results aimed at improving the educational process. The first stage involved a theoretical analysis of scientific literature and regulatory documents related to engineering education in China. In the process of research, scientific publications on the development of engineering education in China, the introduction of dual education and the formation of pedagogical conditions for the development of engineering talents, were investigated, namely: Journal of Vocational Education & Training, Prospects and Challenges, Journal of Philosophy of Education, Journal of Education & Work, Research in Comparative & International Education, Advances in Social Science, Education and Humanities Research. An analysis of regulatory documents regulating the development of vocational technical education in China was conducted. Methods of analysis and synthesis were used to systematise information on existing pedagogical approaches, key challenges, and prospects for the development of dual education. Particular attention was devoted to innovative teaching methods, such as project-based learning, modular approaches, and the integration of interdisciplinary courses. Also were used the interpretative-analytical method for conceptual analysis of scientific literature; content analysis of regulatory documentation to determine the main directions of engineering education in China; methods of theoretical generalisation to formulate generalised conclusions and substantiate practical recommendations.

The second stage included a comparative analysis of educational practices, particularly internships for students in cooperation with enterprises and the implementation of research projects. This involved examining models of collaboration between vocational colleges and enterprises, including the creation of corporate clubs and innovation research centres. This stage made it possible to identify effective practices that contribute to developing students' professional competencies. The third stage evaluated the implementation of active learning methodologies. The use of problem-oriented and modular approaches in curricula was analysed. Methods of modelling and forecasting were employed to develop recommendations for adapting these methodologies to the contemporary requirements of engineering education: improving legislative

regulation of interaction between enterprises and colleges, completing the institutional reform of vocational education, expanding international cooperation, and others.

Results and Discussion

Directions for the development of engineering talent in China

Engineering talent fuels a wide range of sectors, from traditional manufacturing to cutting-edge technologies. Its development has led to the rapid expansion of China's high-tech industries and its subsequent dominance in manufacturing and infrastructure. According to X. Liu *et al*. (2023), key strategic sectors reliant on engineering talent in China are:

1. Manufacturing: China stands as the world's largest manufacturing hub, accounting for over 28.7% of global output in 2023. This achievement would have been impossible without the significant number of engineers specialising in mechanical, electrical, and industrial design.

2. Infrastructure development: Chinese engineers are responsible for some of the world's most ambitious infrastructure projects, including the Belt and Road Initiative (BRI, 2023), which spans multiple continents and involves complex construction, mechanical, and civil engineering efforts.

3. Telecommunications and electronics: China's leadership in 5G technology (through companies such as Huawei and ZTE) and its production of more than 50% of the world's electronics underscore its dominance in electrical and electronic engineering.

4. Artificial Intelligence (AI) and IT: China is heavily investing in artificial intelligence, fostering both research and practical applications. This effort is bolstered by a large number of expert engineers specialising in areas such as data science, machine learning, and robotics.

5. Renewable energy and sustainability: China's engineers are at the forefront of renewable energy technologies, particularly in solar, wind, and energy storage. Their expertise is essential to the country's plan to reach carbon neutrality by 2060, rendering the engineers as key players in achieving that goal.

The distribution of engineers across various sectors is essential for understanding the breadth of China's capabilities (Fig. 1).

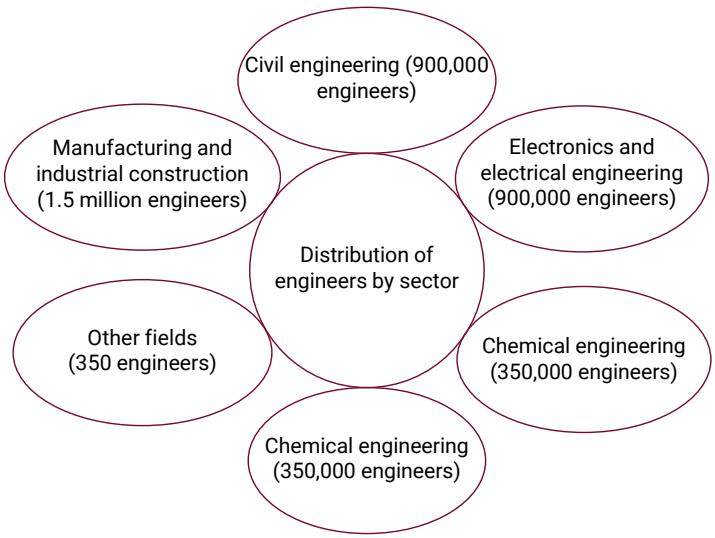

Figure 1. *Distribution of engineers by sector in China, 2023*

Source: *compiled by the author based on data provided by X. Liu et al. (2023)*

A crucial pillar of China's engineering prowess lies in its higher education system, which annually produces a vast number of engineering graduates. However, an equally important yet often overlooked aspect is professional training. Over the past decade, China has produced approximately 1.4-1.5 million engineering graduates annually, accounting for nearly one-third of the global total. This reflects China's strategic focus on STEM education to ensure a steady supply of talent (Liu *et al.*, 2023). Engineers operate in areas of high responsibility, making it imperative to shift the emphasis in the polytechnic education system from merely obtaining qualifications to fostering professionalism. This is critical to ensuring the quality and reliability of technical tasks. Based on the professional engineer program as a comprehensive tool for detailing the requirements for the professional and personal qualities of specialists, a nomenclature of interdisciplinary knowledge, skills, and abilities is determined. This serves as the foundation for successfully performing tasks within a functional-labour complex, incorporating managerial, organisational, and technical components.

Pedagogical conditions for training future engineers in vocational schools in China

One of the essential pedagogical conditions for developing communicative competence in future engineers is the application of a learner-centred approach in education. This approach focuses on fostering dialogic interaction in learning and a dualistic approach to the form of the educational process. According to S. Wei *et al.* (2022), the preparation of future specialists in engineering professions requires specific pedagogical conditions. Table 1 presents several key aspects:

Table 1. *Pedagogical conditions for training future specialists in engineering specialties*

Pedagogical conditions	Meaning
Modular learning structure	dividing the educational process into modules helps students better assimilate material and apply their knowledge in practice
Information and communication environment	creating an environment rich in modern information and communication technologies within professional colleges enhances effective learning
Independent learning	emphasising the development of skills for independent learning and self-education, which is particularly relevant in the context of distance learning
Practical orientation	integrating practical classes and projects into the educational process allows students to apply theoretical knowledge in real-world scenarios

Source: *compiled by the author*

These conditions train future engineers to meet the contemporary demands of professional activity. The primary challenge facing modern technical education in China, and other systems modelled after the Prussian style, lies in passive learning – a classroom-oriented approach centred on the teacher (Wei *et al.*, 2022). This method involves students passively receiving information from educators to memorise for exams or tests. Such pedagogy causes numerous undesirable consequences, including inadequate practical experience, reduced motivation to learn, lack of critical thinking skills, and most significantly, suppression of innovative thinking. A review of scientific literature reveals various perspectives on addressing these challenges. For instance, T. Zhuang & X. Xu (2018) argued that introduction of the foundational principles of "engineering education" can overcome the problem of passive learning in China's vocational technical colleges. Regarding practice-oriented opportunities, S. Wei *et al.* (2022) proposed establishing educational centres within enterprises to serve as bases for engineering practice. These centres may function as workshops or incubation hubs to promote innovation and entrepreneurship. The authors stressed that at least 50% of future engineers should participate in at least one practical

training program during their studies. Recent studies emphasise the importance of active learning methods and an interdisciplinary approach in engineering education. For instance, T. Zhuang & X. Xu (2018) also highlight the integration of natural sciences and mathematics into practical task methodologies, which fosters professional competencies.

Vocational training in engineering is a critical aspect of China's technical workforce. While university education produces engineers with theoretical knowledge and research capabilities, vocational training programs develop technically skilled engineers ready to address practical problems immediately. This system was substantial in Chinese industrial boom and bridging the gap between theoretical education and industry needs. In China, vocational-technical schools have undergone significant development. The country boasts over 10,000 vocational-technical schools, prioritising engineering subjects. These schools graduate hundreds of thousands of students annually, particularly in fields such as mechanical engineering, electronics, automation, and IT. In 2022, approximately 3.6 million students graduated from vocational institutions specialising in technical disciplines, including engineering and related fields (Munkholm & Zhang Consulting, 2024). Graduates of vocational institutions are typically prepared for immediate roles in the industry, whereas university graduates often focus on higher-level, research-based positions. However, both forms of education are increasingly interconnected through collaborative programs between universities and vocational schools.

Chinese manufacturing sector heavily relies on professionally trained engineers and technicians for operating and maintaining high-tech equipment, precision manufacturing, and automation. Vocational training programs in automation, robotics, and industrial engineering were central in industries such as automotive manufacturing, electronics, and consumer goods production. Many graduates join companies, such as Foxconn, BYD, and Huawei, to work on assembly lines, maintain machinery, and program robotics. Chinese transition to renewable energy also depends on professionally trained engineers specialising in the installation and maintenance of solar panels, wind turbines, and energy storage systems. The Chinese government aggressively promotes dual education to increase the number of engineers and technicians. Programs such as the Double First-Class Initiative and the Thousand Talents Plan are designed to develop world-class universities and attract top talent, while reforms in vocational education ensure that practical skills meet industry demands. The government incentivises students to pursue vocational education through scholarships, state grants, and preferential hiring programs (MOE, 2023a; 2023b).

In recent years, China has significantly prioritised improving the quality and accessibility of vocational training programs. The Vocational Education Strategy for 2020-2035 is a long-term policy aimed at building a world-class vocational education system by 2035. A central focus of this strategy is integrating vocational schools with high-tech industries to provide students with training in cutting-edge fields such as robotics, automation, artificial intelligence, and green technologies (The State Council, 2025). China also runs specialised training and retraining programs for technical workers in specific industries, such as coal mining. These programs are designed to requalify workers for roles in emerging fields, including renewable energy and artificial intelligence (CSE, n.d.).

Vocational and technical colleges in China actively incorporate advanced scientific achievements into their educational processes. To ensure the quality of vocational engineering education, these institutions develop full-time educational programs designed to prepare students for immediate employment in production environments. Modern technical colleges combine classroom-based learning with hands-on industrial training to bridge the gap between theory and practice. These institutions aim to provide a flexible and reliable educational process that

combines a strong theoretical foundation with practical tasks. The programs are structured to enable students to acquire professional skills within the shortest possible time frame (Wheelahan & Moodie, 2017). Curricula also include interdisciplinary courses in subjects such as economics, foreign languages, humanities, arts, and music. These subjects are central in enhancing the professional competencies of future engineers. Foreign language education is also emphasised as it helps students develop vital communication skills for engaging in international business and professional exchanges. The breadth of professional courses reflects the focus of Chinese vocational colleges on implementing modern technologies and methods in engineering education. Most vocational and technical colleges in China prioritise practical training. To achieve this, government collaborates with industry leaders and innovative institutions, ensuring students receive real-world experience and guidance. Another common practice in China is the creation of corporate clubs in collaboration with vocational colleges and enterprises. Companies such as Siemens, Schneider, PayPal, Huawei, and ZTE have established such clubs, which facilitate communication between colleges, enterprises, and universities. These organisations are central in fostering closer connections between education, industry, and innovation.

Engineering talent is in high demand in China, prompting vocational colleges to address the needs of enterprises through practice-oriented education and the integration of industry into the learning process. Research groups are established within colleges and enterprises to collaborate on scientific projects of mutual interest. In these projects, enterprise leaders and engineers act as mentors, conducting training sessions that help future engineers acquire essential professional qualities and skills. The creation of these research clubs brings an innovative dimension to partnerships between colleges and enterprises. Entrepreneurial clubs not only reserve human resources for businesses but also provide a platform for enterprises and institutions to explore a dual education mechanism. Simultaneously, they offer vocational colleges opportunities to establish talent development programs. According to R. Guoyuan (2025), the jointly established innovation and research centres serve as crucial platforms for students to develop practical skills and an innovative mindset, facilitating the transformation of scientific research into business opportunities.

Internships are a key component of vocational education in China. Most colleges require students to complete at least 10 months of internships, spread across three phases throughout their studies. The first phase introduces students to the fundamentals of workplace structure, organisation, and operation. The second phase, typically lasting three months, immerses students in basic production processes and workplace scenarios, during which they act as assistant engineers to gain in-depth practical experience (Stewart, 2015). Key trends in the development of professional skills in Chinese technical colleges include:

- integration of innovative pedagogical methods. Techniques such as problem-based learning, team projects, and experiential learning foster professional thinking among future engineers (Schmidtke & Chen, 2012);
- interdisciplinary educational approaches. Adapting knowledge from diverse fields, including interdisciplinary ones, enhances creativity and logical thinking in developing professional qualities for future engineers (Qu, 2024);
- application of new technologies in education. The integration of online virtual platforms, artificial intelligence, and other technologies enhances creativity in engineering, improves knowledge retention, and enables more effective experiments. These technologies also render learning more engaging, offering opportunities for cultural exchange among students from different countries. Virtual platforms enable experiments and research in simulated environments, providing creative solutions without the

limitations of physical resources. Interactive materials encourage active student participation, making learning more dynamic (Chen *et al.*, 2022; Bailey *et al.*, 2024).

The implementation of a dual education approach in training engineers is supported by a robust regulatory framework. The Chinese government has adopted education strategies that encourage students to pursue technical disciplines (MOHRSS, 2012; Vocational Education Law, 2022). Additionally, the government has developed assistance packages for polytechnic colleges that integrate dual principles into their educational processes (The State Council, 2022; 2023). Consequently, the implementation of the dual education system involves the combined efforts of the government, enterprises, and vocational colleges.

Recommendations for improving the quality of training of engineering specialists in China

The training of engineering specialists in Chinese educational institutions should be based on current trends and government initiatives aimed at improving the quality of education and its compliance with the requirements of an innovative economy. The study determined that modern engineering students must first master all the components of professional culture. To train engineers for high-tech industries and the international market, China needs to further transform professional engineering education, addressing the issue of passive learning and the lack of intercultural communication. Although active learning approaches such as dual education were widely studied around the world, their application in China is still in its early stages. In addition, according to A. Koty (2022), Sino-foreign joint education programs, which are designed as a core in promoting intercultural communication in China's engineering education, are usually implemented inefficiently due to the improper integration of active learning methods and the lack of an effective assessment system. The following recommendations can be used to achieve the above:

1. Strengthen scientific education from an early age: it is necessary for primary and secondary schools to strengthen scientific education to stimulate interest in engineering disciplines by introducing more comprehensive scientific programs, improving the qualifications of teachers, and integrating scientific resources into the educational process.

2. Strengthen cooperation between vocational colleges and industry: the integration of education with production is a key element of engineering training. Educational institutions actively cooperate with enterprises to provide students with practical experience and relevant knowledge that meet the needs of the labour market. However, the results of the study demonstrated that the current government policy is uncertain and cannot sufficiently influence the process of interaction between enterprises and colleges. Therefore, the complexity of the relationship between vocational technical colleges and enterprises requires further clarification of rights and obligations in the form of a strict legal framework and a system of rules. At present, the obligations of enterprises in conducting practical classes, their quantity and quality are not regulated, and there is no control over this area. Therefore, it is necessary to regulate this issue both at the legislative level and at the level of college-enterprise interaction. In addition, vocational training in the workplace must be prescribed in the form of regulations to make it more useful for both students and employers. It is necessary to create mechanisms and institutions that effectively stimulate and mobilise the active participation of practitioners. It is worth codifying the obligations of enterprises to participate in vocational education based on colleges. The process of institutional reform will transform a new management system.

3. Use of modern technologies in education: to increase the efficiency of the educational process and prepare students for work in a modern technological environment, it is worth introducing digital technologies and innovative methods into the educational process.

4. International cooperation: joint programs with foreign universities and student exchange allow to adopt best practices and improve the quality of engineering education.

5. Training of highly qualified teachers: it is necessary to provide vocational education institutions with qualified personnel with scientific degrees in the field of engineering and technology, as this is an important factor for the quality training of students. In this case, it is worth not only conducting courses to improve the qualifications of teachers but also involving them in practical training in production.

6. Institutional reform of vocational education: the author believes that the essence of institutional reform of this area of education is the promotion of decentralisation of management through system mechanisms, restructure the organisational functions of educational institutions, clarify the functional roles and responsibilities of each participant in the educational process, and introduce innovative working mechanisms into the college-enterprise relationship.

7. Increasing adaptability: vocational colleges need to quickly increase their adaptability in accordance with the establishment of a city-wide education-industry consortium, which will allow them to better participate in new practices.

8. Stimulating government policies: political incentives alone in the field of vocational education cannot improve the reputation and attractiveness of the engineering profession in China. Therefore, the author believes that it is necessary to combine policies to improve the attitude towards qualified workers, form a decent level of wages for engineering majors, and implement social propaganda measures in relation to vocational education.

9. Establishing a close connection between the socio-economic system and vocational education: it is necessary to coordinate the specialisation of the college with the industry, combine curricula and professional standards, coordinate the learning process with the production process, and provide an academic diploma together with a professional certificate.

In conclusion, enhancing engineering education in China requires a multi-pronged approach encompassing strengthened early scientific education, deeper industry-academia collaboration through a clear legal framework and incentivised participation, integration of modern technologies, expanded international cooperation, highly qualified teaching staff, institutional reforms promoting decentralisation and adaptability, and stimulating government policies that improve the social standing and financial rewards of the engineering profession. These combined efforts aim to address current shortcomings in passive learning and intercultural communication, ultimately aligning engineering education with the demands of a rapidly evolving, innovation-driven economy.

Conclusions

The study concluded that China addresses the need to develop high-quality technical education to ensure their technological leadership in the world. The main strategic areas that currently require engineering talents are manufacturing, infrastructure development, telecommunications and electronics, artificial intelligence, renewable energy. Engineering talents in these areas come mainly from higher education institutions, but vocational technical education is becoming increasingly relevant. The main vector of the development of vocational education in China is the shift in emphasis from obtaining appropriate qualifications to the formation of professional skills and readiness to begin performing professional duties immediately after graduation.

The study established that the main problems in the development of vocational education are passivity of the educational process, insufficient level of practical classes in training, lack of image of vocational colleges and popularity of the profession in society, the closedness of the socio-economic system of China. The research has shown that the Chinese government, being aware of the importance of vocational education and the role of engineering specialties in the development of the country's economy, has

carried out several reforms in the field of vocational education, including encouraging cooperation between colleges and enterprises. The main pedagogical conditions that are currently formed in most vocational colleges in China are the following: modular and project-based learning, student-centeredness, practical training, innovative and digital technologies, interdisciplinary courses, research clubs, trainings. The study determined that Chinese dual system of education vocational technical education is being reformed through the interdisciplinary and student-centred approach.

The study provided the following recommendations to improve the conditions for training engineering specialties: strengthen scientific education from an early age, strengthen cooperation between vocational colleges and industry, including in terms of legislatively establishing the rights and obligations of enterprises and colleges in training future engineers in the form of a strict legal framework; develop regulations for practical classes, expand the boundaries of international cooperation, complete the institutional reform of vocational education; involve teachers in practical training at the enterprise; increase the level of social propaganda; coordinate the specialisation of colleges and industry. Further research could explore the long-term impact of implemented reforms on the quality of engineering graduates and their success in the workforce. It would also be valuable to conduct comparative studies with other countries to benchmark best practices in vocational engineering education and identify areas for further improvement in the Chinese context. Additionally, investigating the effectiveness of specific pedagogical approaches, such as modular and project-based learning, in fostering practical skills and addressing passive learning would be beneficial.

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Conflict of Interest

None.

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Підготовка майбутніх інженерів у закладах професійної освіти Китаю

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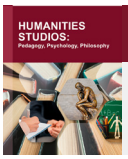
Анотація. Якісна інженерна освіта є ключовим чинником забезпечення технологічного лідерства та економічного розвитку провідних країн світу, зокрема Китаю. У статті розглянуто сучасні підходи до інноваційного розвитку інженерної освіти, орієнтовані на адаптацію до викликів нової економіки. Особливу увагу приділено ініціативі дуальної освіти, яка передбачає інтеграцію теоретичного навчання з практичним досвідом. Такий підхід готує висококваліфікованих інженерів, здатних відповідати вимогам інноваційного розвитку та впроваджувати новаторські рішення. Метою дослідження було визначення педагогічних умов та особливостей підготовки майбутніх інженерів у професійних закладах Китаю. У роботі використано методи аналізу, синтезу та узагальнення для систематизації отриманих результатів. Проаналізовано ключові проблеми професійної підготовки, зокрема пасивність навчального процесу, обмежені можливості міжкультурної комунікації та недостатній рівень впровадження проектного навчання. Особливу увагу приділено ролі співпраці з підприємствами у формуванні практичних навичок студентів. У статті виокремлено основні педагогічні умови, що сприяють ефективній підготовці інженерних кадрів: використання модульного навчання, впровадження інформаційно-комунікаційних технологій, акцент на самостійне навчання студентів і розширення можливостей практичної підготовки. Розглянуто перспективи міждисциплінарного підходу в навчальних програмах, що сприяє розвитку творчого та критичного мислення. Показано, що залучення міжнародних партнерів до навчального процесу може значно посилити якість освіти. Практична цінність дослідження полягає у визначенні шляхів удосконалення підготовки інженерів у професійних технічних коледжах. Отримані результати можуть бути використані для розробки освітніх програм, які поєднують теорію з практикою та сприяють підвищенню конкурентоспроможності випускників на міжнародному ринку праці

Ключові слова: інженери; дуальна освіта; професійні коледжі; технічна освіта; проєктне навчання



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Peculiarities of students' academic activity in extreme conditions: Findings of a pilot study

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Abstract. This article presented the findings of a study on students' academic activity in extreme conditions caused by the prolonged war in Ukraine, which has intensified exposure to stress factors. The study aimed to highlight the results of a pilot investigation into the psychological characteristics of students' academic activity in such conditions to develop recommendations for optimising the learning process. Data collection was conducted using a specially designed questionnaire, with questions focusing on the nature of students' academic engagement and their perceptions of their own academic performance. The findings indicated that students were capable of maintaining a high rate of learning, demonstrating diligence in completing tasks, sustaining intrinsic motivation for study, and effectively regulating their actions in stress-inducing conditions. Additionally, challenges encountered in extreme learning conditions were examined, with the most frequently reported difficulties including a sense of tension and burden in the learning process, superficial knowledge acquisition, rapid forgetting of learned material, slow processing of academic information, and a lack of systematic approach in academic activities. It has been established that the assessment of students' academic performance largely depended on the characteristics of their academic activity. High and average grades were mostly associated with positive or mixed academic characteristics, whereas low grades were more frequently accompanied by negative ones. An analysis of the obtained data, along with similar studies, has enabled the identification of potential factors influencing students' academic performance under such conditions. The findings of this study may be utilised to develop effective emergency learning plans, enhance the flexibility of the educational process, implement measures to support students' psychological well-being, and establish a systematic monitoring framework for their welfare during wartime and post-war conditions, as well as in response to other extreme circumstances

Keywords: stressful wartime conditions; knowledge acquisition; nature of academic activity; academic performance; stress

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Introduction

The choice of topic for this research was determined by the geopolitical context in Ukraine, caused by Russian aggression. This situation has created new challenges for the functioning of the education system, including for students, who are under increased stress and threat to life. Therefore, it is crucial to understand the role of not only economic but also psychological resources of society in addressing such challenges. This sets the framework for an in-depth study of the psychological aspects of students' academic activity under martial law. The problem of students' academic activity in extreme conditions has a broader context, as global conflicts, pandemics, natural disasters, and other emergencies constantly create conditions that can affect learning. In such circumstances, there is a growing need for research aimed at analysing how young people adapt to new realities, maintain motivation to learn and sustain the effectiveness of their academic effectiveness, and what difficulties arise along the way.

The significance of the situation, its unpredictability, and uncontrollability, coupled with the threat to students' personal safety, create unique circumstances for studying their psychological reactions, coping strategies, and mechanisms. In the context of war, which threatens both physical and psychological safety, analysing the characteristics and outcomes of learning can reveal the specific impact of armed conflict on students' education and overall psychological resilience. Students' academic activity in extreme conditions is a complex and unique process. Its study requires considering the structure of the activity phenomenon itself. This perspective enables the identification of the most critical aspects to be addressed when developing support programmes for students in challenging circumstances, ensuring the continuity of their learning process and psychological well-being. To date, there is no unified theory or comprehensive research and monographs that would fully describe this type of activity in extreme conditions, including wartime. However, individual studies shed light on aspects that help to better understand this phenomenon.

A review should begin with studies dedicated to exploring the psychological impact of the COVID-19 pandemic. It created conditions that could be characterised as extreme for many people worldwide, including affecting the nature of academic activity. As S. Wilks *et al.* (2023) and K. Varyvoda (2022) note, the pandemic's negative impact on students' psychological well-being and academic performance was largely due to the sudden shift to a virtual learning environment. Additionally, it was found that students' awareness of COVID-19 generally mitigated the negative impact on their performance and well-being. Further evidence of the pandemic's negative effects on students' mental health is provided by other studies, including those by Italian researchers L. Villani *et al.* (2021). As Italy was the first European country to impose a lockdown due to the pandemic, its students were among the first to adapt to new learning conditions. The researchers found that a significant portion of students exhibited signs of high anxiety and depression. The risk of developing anxiety was associated with being female, fears about the pandemic and its consequences, the inability to participate in university life, and the inability to see a partner. Regarding academic performance, authors K. Mueller *et al.* (2024) found that the average grades of the student sample studied remained unchanged during the COVID-19 pandemic. This is supported by other researchers. For example, E. Lagmay & M. Rodrigo (2022) note that under the influence of extreme conditions caused by the COVID-19 pandemic and weather conditions, the overall activity of students decreased, but this decrease only applied to those activities that did not affect their final grades.

The study of the impact of the COVID-19 pandemic on the characteristics of students' academic activity is part of a broader discourse that considers the impact of extreme conditions and the stress caused by them or stress as such in the context of academic activity and psychological

well-being. Based on a comprehensive review of research over the past 10 years, authors A. Córdova *et al.* (2023) conclude that stress and negative emotional states generally have a negative impact on the learning process. Overall, test anxiety is most often in the spotlight. As shown by the results obtained by J. Cassady & W. Finch (2020), the level of test anxiety is highest in the following cases: when students adhered to a pronounced external or internal goal orientation; when academic tasks had an uncertain outcome; when students used passive learning strategies; when learning strategies were more personally involved.

However, beyond the examination situation, other factors influencing students' psychological well-being are also considered. For instance, M. Mofatteh (2021) conducted a comprehensive literature review to identify risk factors associated with stress, anxiety, and depression among students. The study revealed that the predominant factors in most research were psychological, academic, biological, social, financial, and lifestyle. As evident from this list, factors such as the geopolitical context and war were not the focus of most researchers, at least until recently. Regarding the impact on psychological well-being, researchers G. Chen *et al.* (2024) examined the relationship between life events, coping styles, and subclinical depression among medical students. The results showed that negative life events positively correlated with subclinical depression and negative coping styles and had an inverse correlation with positive coping styles.

In general, activity in extreme conditions has long been the focus of significant research to study the psychological characteristics of certain professions and issues related to professional suitability. This includes professions such as military personnel, firefighters, medical and emergency services, astronauts, and police officers. A review of selected studies highlights key findings in this field. As authors M. Turliuc & A. Balcan (2023) note, the results of a two-stage study conducted over four months on gendarmes showed that perceived operational stress (OpS) and organisatioal stress (OrgS) in peacetime have a significant negative impact on psychological well-being (PWB) four months after experiencing stressful situations. Perceived social support plays a significant mediating role in the relationships between OrgS and PWB, as well as between OpS and PWB at both stages of the study. Among coping mechanisms, only self-control (and only at the second stage of the study) acts as a significant mediator in the relationship between OrgS and PWB. These results highlight the increased impact of ordinary stressors, which can occur both at home and at work, on individuals with military experience, as well as the importance of providing effective psychological support methods.

Another study, conducted by T. Craddock & G. Telesco (2021), found that police officers who regularly encounter critical incidents exhibit negative changes in their worldview and perception of others, especially after prolonged exposure to traumatic situations. A correlation was found between years of service, frequency of such incidents, and symptoms of post-traumatic stress. The stigma associated with seeking psychological help, perpetuated by police culture, exacerbates these problems, impacting physical and mental well-being. Changes in lifestyle and even circadian rhythms are common occurrences during life and study in extreme conditions, caused by various factors: from mood swings and nervous system exhaustion leading to difficulty falling asleep, to air raid sirens and nighttime combat. The consequences of such impacts, including on cognitive function, can be traced by studying civilian pilots. Research by S. Yang *et al.* (2024) showed that over 70% of pilots' work schedules disrupt circadian rhythms, and 47.44% of pilots work in highdemand modes. The worst results in cognitive tests were observed during early shifts. Sleep problems, especially before morning shifts, are also common. Given that students' learning typically begins in the morning, these facts require special attention.

When studying the impact of extreme conditions on academic activities, it is impossible

to ignore the phenomenon of the bidirectional psychosomatic connection, as stress and other negative states can not only directly cause changes in cognitive functions but also induce anatomical and physiological changes in the brain, which also affects academic activities characteristics. Authors A. Fassett-Carman *et al*. (2022) also highlight this issue in their study. They found that the perception of a lack of control over dependent (self-induced) stressors is associated with changes in brain structure, specifically with a larger volume of grey matter in the amygdala in girls and a greater thickness of the medial prefrontal cortex in boys. The goal of this article was to establish the characteristics of students' academic activities in extreme conditions and their attitudes towards the results of their own academic activities.

Materials and Methods

The study was conducted in 2023-2024 among first- to fourth-year students at the National University of Life and Environmental Sciences of Ukraine and Irpin Professional College (Kyiv Region, Ukraine). The total number of respondents was 238. All participants were selected using a random sampling method. A survey using a custom-designed Google Form questionnaire was used to conduct the study. The questionnaire consisted of two main sections of questions:

- Section 1: Assessment of academic performance. In this section, respondents rated their academic performance on a scale from "high" to "low", which helped determine how students perceive their ability to grasp learning material and apply knowledge under stress.
- Section 2: Assessment of academic activity characteristics. This section contained questions that assessed various aspects of students' academic activities, such as the speed of learning material, quality of knowledge, independence, motivation to learn, and the ability to organise cognitively. To analyse these aspects, the parameters identified by G. Clauss (1987) were used, allowing for a deeper understanding of the psychological aspects of the learning process in extreme situations.

The key indicators of the nature of academic activity included:

1) speed of processing academic information and associated measures of task intensity, strength, and durability of acquired knowledge;

2) thoroughness and associated depth of acquired knowledge;

3) motivation and associated desire, initiative, and activity level;

4) action regulation and associated diligence, independence, and planning;

5) cognitive organisation and associated awareness of learning.

As indicators of attitude towards academic performance, the assessment of the level of one's own academic performance and the comparison of academic success in the current year with the previous academic year were considered.

The study was conducted following the American Psychological Association's principles for human research (APA, 2003). All participants received clear information about the purpose and objectives of the study, as well as the ability to withdraw from participation at any time without giving a reason. Respondents provided consent to participate in the study, confirming their agreement to data processing when submitting the questionnaire. The confidentiality of the collected data was also ensured: respondent data was collected and used only in an anonymised form, and the research results did not contain any personal information.

Quantitative methods were used to analyse the research results, including descriptive statistics and correlation analysis to identify correlations between academic activity and academic performance. Additionally, qualitative analysis and interpretation of the data were carried out, allowing for assumptions to be made about the identified features of students' academic activities.

Results

The research revealed a wide range of perceptions among participants regarding the nature

and outcomes of their own learning. Notably, most participants reported positive responses regarding the speed and related characteristics of their academic activities. However, there was also a significant percentage of participants who reported slow information processing, tension during learning, and rapid forgetting of the material studied (Fig. 1).

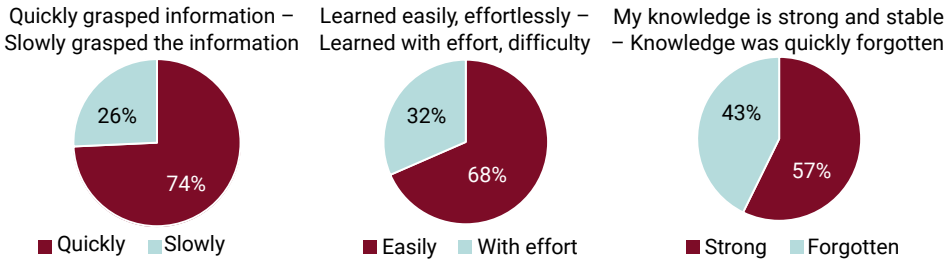

Figure 1. *Results of the study on the speed of academic activities among participants*
Source: *author's development*

The indicator of the durability of acquired knowledge is particularly noteworthy, as a significant proportion of participants who reported ease and satisfactory speed of information acquisition also indicated both rapid forgetting of information and, conversely, the strength of knowledge over time. Therefore, these indicators require a more detailed analysis to clarify the exact relationship, especially when considering the potential onset of stress due to extreme conditions. Almost all participants tried to be conscientious in their studies, but slightly less than half of the participants assessed their knowledge as deep. A significant proportion of participants – more than half – noted the superficiality of the acquired knowledge (Fig. 2).

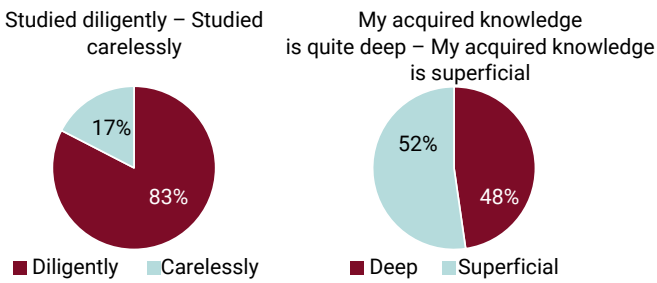

Figure 2. *Results of the study on the thoroughness of academic activities among participants*
Source: *author's development*

Despite the desire to study diligently, many students faced difficulties in achieving a deep level of knowledge. The noted superficiality may be a result of insufficient integration of acquired knowledge or a lack of practical application of the material studied. According to researchers K. Alshamrani *et al.* (2021), this underscores the importance of not only theoretical mastery but also a deep understanding of acquired knowledge and skills, which will help students better learn and apply knowledge in various contexts.

These indicators, like the previous ones, showed a significant difference between the effort exerted, as measured by conscientiousness, and the quality of the knowledge acquired. A significant proportion of respondents indicated that they

studied diligently, yet their knowledge proved to be superficial. This indicates the complexity of the relationship between these indicators, or their mediation by other factors that may reduce the quality of knowledge, even if it was acquired diligently. In particular, the negative impact of stress on cognitive processes and the brain was described in studies by L. Schwabe *et al.* (2022), K. Caudwell *et al.* (2023), and J. Novotný *et al.* (2024).

The neurobiological mechanism by which extreme conditions and stress impact long-term memory and learning ability involves a complex hormonal interaction (Defante *et al.*, 2024). Acute exposure to a stressor results in the release of large amounts of norepinephrine and cortisol, a glucocorticoid. The interaction between these two agents, particularly in the central nervous system, impairs working memory function and disrupts the attentional functions of the prefrontal cortex, directing attention solely towards threatening stimuli, and thereby hindering the consolidation of information unrelated to the threat. Additionally, a small percentage of participants reported a decreased desire to learn, engaging in academic activities out of a sense of duty, and experiencing lethargy and a decline in activity (Fig. 3).

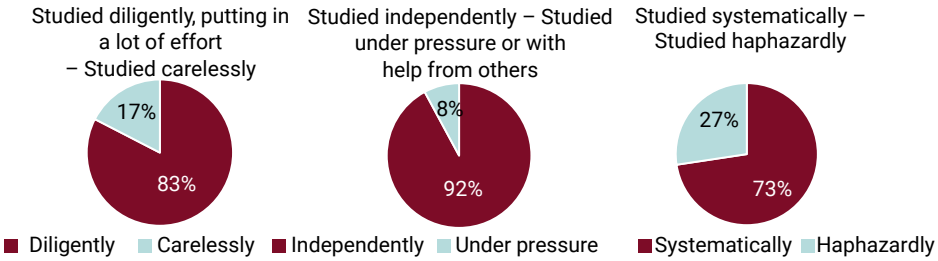

Figure 3. *Results of the study on the motivation of academic activities among participants*
Source: *author's development*

Almost all students studied independently, without additional pressure or help from others, and tried to be diligent, with the vast majority adhering to a systematic and planned approach to learning. Differences in the distribution of the indicators studied may also indicate that most respondents were driven by intrinsic motivation, as evidenced by the high percentage of those who reported independence in learning (Komariah *et al.*, 2024). However, according to researchers R. Ryan & E. Deci (2000), this does not always imply diligence in learning and even less so indicates a systematic approach. A small proportion of respondents, however, combined independence and diligence in learning with a lack of systematicity. At the same time, about a quarter of the respondents reported low motivation to learn (Fig. 4).

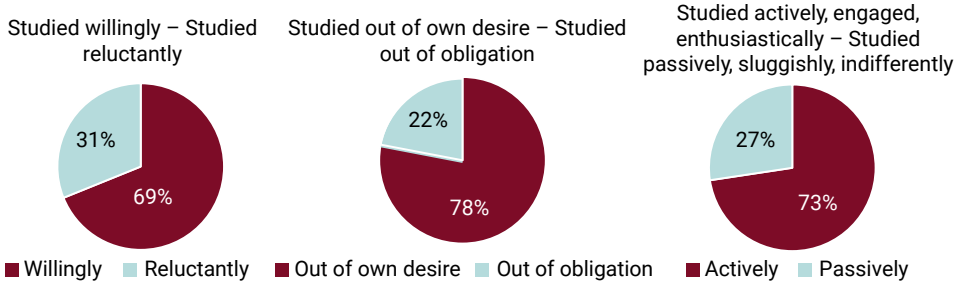

Figure 4. *Results of the study on the regulation of academic activities among participants*
Source: *author's development*

The data presented demonstrates the existence of a certain group of students who, despite their independence, did not feel a sufficient level of intrinsic interest in the learning process. According to Z. Alj & A. Bouayad (2024), such a situation can negatively impact learning outcomes, as even independence and diligence do not always compensate for a lack of motivation and systematic approach. These findings complement the previous ones, as they confirm the predominance of intrinsic motivation in learning, as most respondents indicated their independence in learning and their own desire to learn. However, a discrepancy was also noted between the number of those who indicated intrinsic motivation to learn and the desire to learn as such. The number of respondents who indicated learning out of their own desire was significantly higher than the number of those who studied willingly and actively. Therefore, the presence of intrinsic motivation in learning does not necessarily mean a desire to learn actively. The students were able to carry out their academic activities consciously. A certain proportion noted the mechanical nature of their academic activities (Fig. 5).

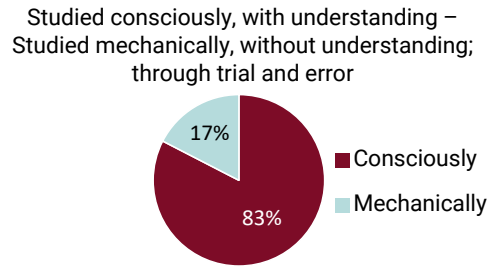

Figure 5. *Results of the study on cognitive regulation in academic activities among participants*

Source: *author's development*

From an activity-based perspective, actions performed mechanically can no longer be strictly called activities, as this implies conscious effort towards a desired goal. Therefore, mechanical actions are more appropriately termed operations. As E. Fromm (1994) pointed out, such an approach to learning risks leading to a loss of motivation and the emergence of the phenomenon of "alienation", as the actions performed during learning lose their personal meaning. In other words, what a student does during learning is not directly connected to their real motives (Längle, 2002). Moreover, while there may be an objective connection between actions and motives, for personal meaning to arise, this connection must also become subjective, it must be conscious.

The obtained data showed that the majority of respondents rated their academic performance as average, about a fifth as high, and approximately the same proportion rated their performance as below average or low. Furthermore, the majority of respondents were those whose academic activities either remained at the same level as before the impact of wartime conditions or even improved slightly; about a fifth were those whose learning activities improved significantly; and a small percentage were those whose academic activities decreased slightly or significantly (Fig. 6).

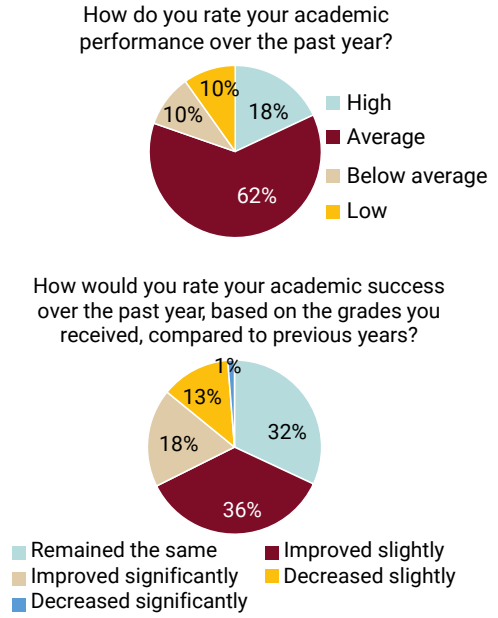

Figure 6. *Results of the study on cognitive regulation in academic activities among participants*

Source: *author's development*

The results presented demonstrate that most respondents were driven by intrinsic motivation, yet they predominantly rated their academic performance as average. By summarising the results obtained for the characteristics of academic activities for each participant, three groups of participants were identified: those who noted only positive characteristics of their academic activities; those who noted only negative characteristics of their academic activities; and those who noted both positive and negative characteristics of their academic activities. The largest group was the third one, indicating that most students were aware of both their strengths in learning and the difficulties they faced. Approximately one-fifth of respondents belonged to the group that evaluated their academic activities predominantly positively, which may indicate their high self-organisation, motivation, and adaptability to learning requirements. In contrast, a very small percentage of students noted exclusively negative characteristics of their activities. This may indicate the presence of deeper problems such as chronic stress, low motivation, or significant difficulties in mastering the learning material, which require additional attention and support. Such a distribution highlights the importance of an individual approach when working with students, as each group requires different approaches to improve their academic activities and overall psychological well-being (Fig. 7).

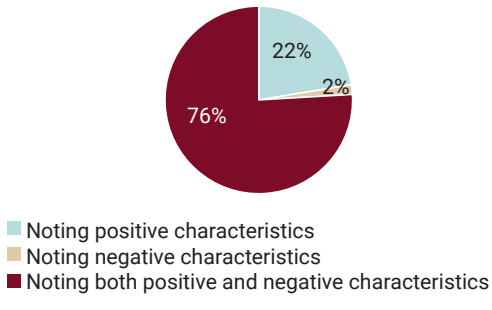

Figure 7. *Groups of participants based on the characteristics of academic activities*
Source: *author's development*

When comparing students' self-assessments of their own learning effectiveness across different courses, no visible trend was observed. In other words, most students, regardless of their year of study, perceived their own diligence and effectiveness in learning as practically the same. However, they noted a moderate to significant decrease in academic achievement when considering the assessment results (Fig. 8).

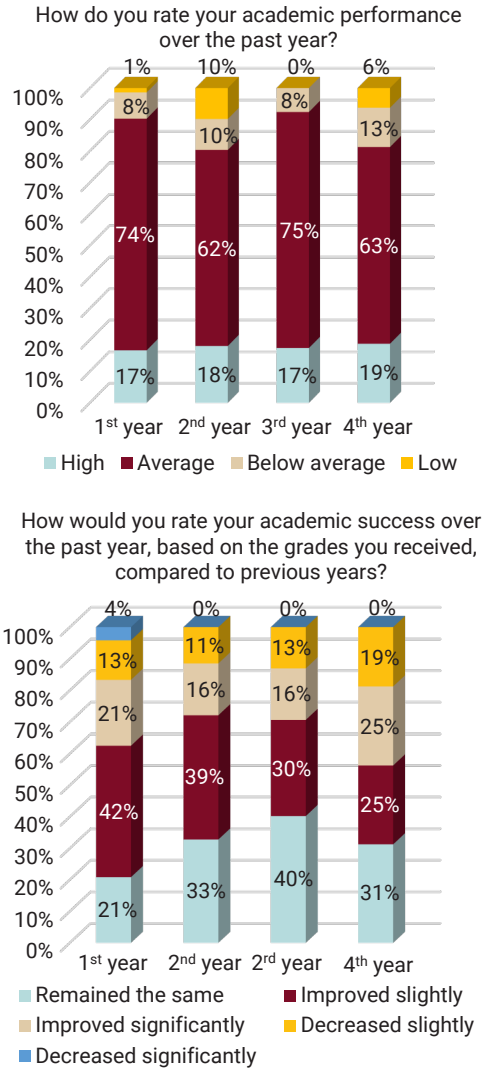

Figure 8. *Results of the study on the academic performance of participants*
Source: *author's development*

The data presented shows that students' perception of their diligence and effectiveness in learning remained stable throughout the study period, regardless of the year of study. However, the actual results, particularly grades, indicated a decrease in academic achievement over time. This may be due to an increase in the complexity of learning tasks in higher years, an increase in the amount of material, or other factors that make it difficult to achieve high results. Despite a subjective feeling of self-efficacy, students may experience difficulties in adapting to new demands, leading to a decrease in academic achievement. This highlights the need not only for independence and perseverance but also for effective support for academic activities at all stages of education.

A comparison of the indicators of students' academic performance and the characteristics of how these performance among students revealed the following:

- high and average ratings of academic performance among the respondents correlated with positive or a combination of positive and negative characteristics of academic activities;
- ratings of academic performance below average correlated with a combination of positive and negative characteristics of learning activities;
- low ratings of academic performance, unlike those with higher ratings, correlated with a combination of positive and negative characteristics of academic activities;
- the maintenance or improvement of academic performance levels under extreme conditions was associated in the respondents with positive or a combination of positive and negative characteristics of their academic activities;
- a decrease in the level of academic performance was associated with a more frequent occurrence of negative characteristics of this activity;
- respondents who noted only negative characteristics of their academic activities during the period of wartime rated their academic performance as low, as well as significantly decreased, slightly decreased, or remained at the same level (Table 1).

Table 1. *Distribution of respondents based on the correlation between indicators of academic performance and the characteristics of academic activities*

No.	Group of respondents based on the characteristics of academic activities	Academic performance, %								
		Level of performance				Comparison of performance with previous academic years				
		High	Average	Below average	Low	Remained the same	Improved slightly	Improved significantly	Decreased slightly	Decreased significantly
1	reporting only positive characteristics	67	15	-	13	27	23	27	3	-
2	reporting both positive and negative characteristics of academic activities	33	85	100	37	70	77	73	94	67
3	reporting only negative characteristics of academic activities	-	-	-	50	3	-	-	3	33
	Total, %	100	100	100	100	100	100	100	100	100

Source: *author's development*

A correlation analysis conducted to examine the possible relationship between indicators of the nature of academic activities and their outcomes revealed several moderate correlations. Specifically, it was found that an increase in self-rated academic performance was positively correlated with the speed of learning information ($r = 0.322$, $p \leqslant 0.01$), the strength of acquired knowledge ($r = 0.389$, $p \leqslant 0.01$), diligence in studying ($r = 0.416$, $p \leqslant 0.01$), the quality and depth of acquired knowledge ($r = 0.445$, $p \leqslant 0.01$), personal desire to learn ($r = 0.352$, $p \leqslant 0.01$), activity in learning ($r = 0.346$, $p \leqslant 0.01$), diligence in learning ($r = 0.416$, $p \leqslant 0.01$), systematic approach to learning ($r = 0.331$, $p \leqslant 0.01$), and a conscious approach to learning ($r = 0.381$, $p \leqslant 0.01$).

Thus, students' academic performance ratings are closely related to the nature of their academic activities. High and average grades were typically accompanied by positive or mixed characteristics, while low grades were associated with more frequent negative characteristics. Maintaining or improving academic outcomes under extreme conditions was often associated with positive or mixed characteristics, while a decline in performance was more often associated with negative characteristics. However, most of the correlations were moderate, and there were no strong correlations, suggesting some variability in the relationship between performance and the nature of academic activities.

Discussion

This study has obtained data on the characteristics of students' academic activities under the extreme conditions of martial law. A custom-designed questionnaire was used as a method of data collection. On the one hand, this made the study unique, but on the other hand, it created difficulties in comparing the data with similar studies, as in this context, it was necessary to rely only on individual aspects. Regarding the obtained indicators of the durability of acquired knowledge (57% noted the strength of the acquired knowledge), the study by authors M. Weggemans *et al*. (2017) is noteworthy. The authors conducted a surprise knowledge test of second-year students to assess the strength of the knowledge they had acquired in their first year. It was found that only 46% of students demonstrated strong knowledge, which is 11% less than in the current study. However, it is necessary to consider the methodological differences between the studies, namely the use of tests and questionnaires, respectively, as well as possible differences in the forms and methods of student learning. Moreover, the research of M. Weggemans *et al*. (2017) does not mention the impact of extreme conditions on students.

In another study conducted by K. Alshamrani *et al*. (2021), a difference was found in the strength of acquired knowledge when using a mixed and passive approach to learning. Thus, the strength of knowledge with a passive approach varied within the range of 47.6-64.1%, while a mixed approach showed higher results (61.5-78.6%). The indicators of the strength of acquired knowledge using a passive approach correspond to the results obtained in the current study. However, K. Alshamrani *et al*. (2021) did not mention that the students' academic activities were accompanied by the influence of extreme conditions. There are also methodological issues related to the fact that in the study by K. Alshamrani *et al*. (2021), different approaches to learning were used, which was not a criterion for differentiating respondents in the current study.

The high level of superficiality of the acquired knowledge (52%), obtained in the current study, can be explained by the probable influence of stress factors caused by extreme conditions. In the study by M. Girotti *et al*. (2024), it was established that in most cases, temporary acute or chronic stress led to a deficit in cognitive flexibility, which affected attention switching, concentration, and analysis of diverse information. A similar nature of stress is associated with a decrease in the time allotted for decision-making and a shift in decisions towards impulsivity, risktaking, and dependence. That is, one can speak of a decrease

in the ability to self-regulate. Also, as a rule, acute stress leads to a deficit in working memory.

The ability to self-regulate is typically associated with ease of acquiring knowledge and skills, and conversely, a reduced ability for behavioural inhibition can lead to frequent distractions and a subjective feeling of difficulty during learning, which hinders the learning process and the durability of knowledge over time. In this context, the results of the current study are interesting: about a third of respondents reported stress in learning and almost half reported superficiality of the acquired knowledge. However, whether the obtained data is a result of a decrease in the ability for behavioural inhibition due to stress requires further study. Since the current study did not involve selecting participants based on the presence of stress or other conditions caused by extreme conditions. The indicators of awareness in learning obtained in the current study (83%) may demonstrate a high level of metacognitive awareness among the respondents, which is closely related to awareness and motivation to learn. In particular, in the study by R. Abdelrahman (2020), the relationship and nature of the influence of metacognitive awareness and motivation on the success of academic activities were investigated, and as a result, no significant differences were found between the gender of students and academic success. However, it was justified that there is a significant difference in metacognitive awareness. Female students demonstrated a higher level of metacognitive knowledge and metacognitive regulation. Furthermore, it was found that intrinsic and extrinsic motivation were essentially independent. However, extrinsic motivation did not suppress intrinsic motivation, and both types showed a slight compatibility in male students. Conversely, in female students, both types of motivation were compatible or even shared. It is worth noting that the study was conducted in an Arab culture, with its inherent views on gender roles.

The non-linear relationship between motivation to learn, effort, and achievement found in the current study requires further investigation. In this context, the study by H. Wu *et al.* (2020) is interesting, which examined the relationship between the nature of motivation and academic achievement among medical students. It was found that students demonstrated different levels of intrinsic motivation and academic achievement depending on the educational institution. Male students reported higher intrinsic motivation but lower academic achievement than female students. The overall impact of intrinsic motivation on academic achievement was greater than the impact of extrinsic motivation. There were significant indirect effects of intrinsic or extrinsic motivation on academic achievement through engagement in learning. Additionally, both intrinsic and extrinsic motivation predicted self-efficacy; however, the direct impact of self-efficacy on academic achievement was insignificant.

Finally, it is worth noting that the impact and consequences of extreme conditions are not direct, which creates difficulties in identifying the root cause of certain changes in academic activities. For example, in a study by A. Özbay & M. Çelik (2024), the complex influence of psychological resilience, anger, and hostility on life satisfaction and attachment style among students was studied. The initial analysis confirmed that psychological resilience, as well as anger and hostility, partially mediate the relationship between secure and anxious attachment styles and life satisfaction. These determinants of life satisfaction are particularly important in wartime conditions, as aggression causes a natural reaction of anger and hostility towards the aggressor. Also, attachment style is extremely important for first-year students, who usually have a more pronounced need for social support from family and friends, which can affect their academic activities. In another study conducted by A. Cataldo *et al.* (2023), it was argued that online learning, which is forced due to security concerns, creates difficulties due to the mediated influence of sociopsychological factors. It was indicated that online learning can be a source of technostress, as students have to share their family space and time with their

studies. That is, the issue is not online learning as such, but the fact that it is carried out from the home environment. Another conclusion is that the conflict resulting from the difficulties of combining study and family affects academic performance. And, finally, the peculiarities of online learning and the resulting conflict can lead to a decrease in learning motivation.

Conclusions

While pursuing education amidst a country at war, students have demonstrated the ability to maintain a high speed of information acquisition, diligently engage in academic activities, sustain internal motivation and activity within the learning process, and regulate their actions in learning with a conscious approach to their academic activities. This can be explained by the high plasticity of the nervous system in youth, which allows for adaptation to new stressful conditions. Among the student population, there is also a portion that faces various difficulties in academic activities. The most common of these include: superficiality of acquired knowledge (52%), feelings of stress and difficulty in learning (32%), rapid forgetting of acquired information (43%), slow processing of information (26%), and lack of systematicity in academic activities (27%). Such data can be explained by the prolonged influence of war-related stress factors. These difficulties can have a significant impact on students' academic achievement and overall motivation.

Students in extreme conditions have the ability to maintain or even improve their academic performance, feeling that they have acquired new competencies. This can be due to various factors, including a desire for positive change. External circumstances that stimulate students to show initiative and independence also play an important role. Moreover, the desire for change and improvement can serve as a powerful driving force in the learning process, even under stressful conditions. A decrease in academic performance among students in wartime conditions is quite possible and is normal in abnormal conditions – in times of war. The constant feeling of anxiety, danger, and uncertainty negatively affects the ability to concentrate, memorise information, and effectively participate in the learning process. Under such conditions, a decline in academic performance is not a sign of negligence or weakness on the part of students but rather indicates a deep impact of external circumstances. However, it is important to note that the decline in results is a temporary phenomenon. Additional attention should be paid to a small group of students whose academic activities were accompanied by negative characteristics. They typically exhibit low academic performance and have experienced a decline in academic achievement. The reasons for this may be the experienced stress and trauma resulting from difficult life circumstances such as war, loss of loved ones, forced displacement, or physical danger.

During the analysis, a significant amount of information was collected and systematised, covering the key parameters defined at the stage of setting tasks. While the results reflect both expected trends and unexpected facts that may have an impact on the further development of research on the problem of student academic activities in extreme conditions. Given the limitations of this study, which is descriptive, it should be emphasised that the results require further analysis and expansion. In particular, further research could be directed towards the development and testing of effective psychological interventions and learning strategies aimed at overcoming the identified difficulties: developing stress resilience, improving cognitive functions, optimising memory and information organisation processes, and providing individualised support to students who experience significant difficulties in learning in extreme conditions.

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Conflict of Interest

None.

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Особливості навчальної діяльності студентської молоді в екстремальних умовах: результати пілотажного дослідження

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Анотація. У статті висвітлено результати дослідження навчальної діяльності студентської молоді в екстремальних умовах, зумовлених впливом тривалої війни в Україні, що супроводжуються підвищеним впливом стрес-факторів. Метою роботи було висвітлення результатів пілотажного дослідження психологічних особливостей навчальної діяльності студентів в екстремальних умовах задля розробки рекомендацій щодо оптимізації навчального процесу. Для збору даних було використано авторську анкету, запитання якої були спрямовані на вивчення характеру здійснення навчальної діяльності студентами та ставлення студентів до результативності власної навчальної діяльності. Було виявлено, що студенти здатні зберігати високу швидкість опанування навчального матеріалу, проявляти ретельність у виконанні завдань, підтримувати внутрішню мотивацію до навчання та ефективно регулювати свої дії в стресогенних умовах. Також досліджено труднощі, що виникають під час навчання в екстремальних умовах, серед яких найчастіше проявлялися такі: відчуття напруженості й важкості навчального процесу, поверхневість отриманих знань, швидке забування опанованої інформації, уповільнене опрацювання навчальної інформації, відсутність системності в навчальній діяльності. Встановлено, що оцінка результативності навчальної діяльності студентів значною мірою залежала від особливостей їхньої навчальної діяльності. Високі та середні оцінки здебільшого були пов'язані з позитивними або змішаними характеристиками навчальної діяльності, тоді як низькі оцінки частіше супроводжувались негативними характеристиками. Аналіз отриманих даних та подібних досліджень дозволив узагальнити потенційні чинники, що впливають на результативність навчальної діяльності студентів у таких умовах. Отримана в результаті дослідження інформація може бути використана для розробки ефективних екстрених планів навчання, підвищення гнучкості освітнього процесу, впровадження заходів з підтримки психологічного здоров'я студентів та системного моніторингу їхнього благополуччя в умовах воєнного та повоєнного стану, а також внаслідок впливу екстремальних умов, зумовлених іншими чинниками

Ключові слова: стресові обставини війни; набуття знань; характер навчальної діяльності; результативність навчальної діяльності; стрес

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Characteristics of the thinking style of student youth

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Abstract. The necessity of optimising the educational process in higher education institutions considering the requirements of the times determines the significance of addressing the psychological characteristics of its participants. The significance of the individual's thinking activity in learning and the insufficient development of the problem of its features in modern student youth have led to the purpose of the present study – to identify the style characteristics of the thinking activity of student youth. The study highlighted the findings of an empirical study of the style characteristics of students' thinking activity, conducted using a series of psychodiagnostic methods. The data obtained by each of the methods in the sample as a whole and within the following groups were analysed: boys, girls, first-year, second-year, third-year, fourth-year, and master's students. The methods of mathematical and statistical data processing were employed to determine the reliability of differences between the groups in terms of the levels of development of certain characteristics of thinking activity. As a result of applying factor analysis, eight factors were identified that structure the description of the style characteristics of students' thinking activity: creativity of the style of thinking, style of perception of information, style of evaluation of information, style of information transformation, style of operating with symbols, style of orientation of the thinking process (result), style of orientation to the quality of the result, activity of the thinking process (orientation to the search for alternatives). Based on the analysis of empirical data, it was concluded that the systemic nature of the style of thinking activity of students, the diversity of style characteristics of students' thinking activity, the presence of comparable and differing characteristics of the style of thinking activity of students of various courses and genders. The practical value of the obtained findings lies in the possibility of using them to improve teaching methods in higher education institutions, in understanding the causes of

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challenges for individual students in learning, in guiding the selection of psychodiagnostic tools in case of need to clarify the characteristics of individual parameters of the style of thinking activity

Keywords: creativity of thinking; style of perception of information; style of mental evaluation of information; psychological characteristics; operation with symbols in the thinking process; optimisation of the educational process

Introduction

The need for continuous improvement of the educational process at universities, considering the needs of the labour market and the current specific features of the development of Ukrainian society in the context of war, requires addressing the psychological characteristics of its participants to ensure their professional development. There is no doubt about the role of the cognitive sphere of the individual and their intelligence in educational activities. The well-known psychological features of the cognitive sphere in the student's age include the development of theoretical thinking and its qualities such as criticality, activity, and independence of mental activity, a pronounced desire for generalisations, development of intellectual reflection, productivity, originality of thinking. They develop a readiness for multivariate search for answers to problems that arise during learning. Intellectual development at this age lies in the formation of an individual style of mental activity, which is a kind of system of psychological tools that a person uses to solve various problems (Reva, 2022).

Psychology uses the term "cognitive style" to describe the style of mental activity, which refers to relatively stable individual characteristics of cognitive processes, manifested in the cognitive strategies used by a person, stable characteristics of thinking, perception, and memorisation. Much attention is paid by Ukrainian researchers to the issues of cognitive styles, intelligence, and its types, and the study of individual characteristics of the individual's thinking activity. N. Zabolotna & V. Omelianska (2023) noted that cognitive styles affect the regulation of human behaviour. Y. Karpenko *et al.* (2024) highlighted the relationship of emotional intelligence with various components of personality motivation. Y. Horbenko (2021) substantiated the significance of such characteristics of thinking as criticality and reflection in the modern information society, noting that they can help a person to look for alternative creative solutions. O. Zaretska (2023) pointed out the vital role of reflection as one of the intellectual and cognitive factors of a person's interpretive competence.

The development of certain characteristics of thinking, such as criticality and creativity, is being actively discussed in the world science. I. Cananau *et al.* (2025) highlighted the essence of the idea of critical thinking in the documents defining the policy of teacher training at a Swedish university. N. Xhomara (2020) substantiated the effects of personalised learning and students' previous achievements on the development of their critical thinking skills. E. Ballova-Mikuskova (2021) addressed the relationship between criticality and creativity of thought as important achievements, noting that creativity allows creating a thought, while criticality – to evaluate it, make judgements. J. Liu *et al.* (2024), exploring the "higher-level" skills needed by future citizens, included critical thinking in their list. M. Dechaume *et al.* (2024), upon studying the relationship between cognitive abilities and creativity, concluded that creative thinking is not a single general construct, but a subject-specific phenomenon (i.e., dependent on the field of creativity). M. Liang *et al.* (2024) substantiated the plasticity of divergent thinking and the possibility of its development through targeted cognitive training.

Relatively new in the modern psychological and pedagogical science is the study of clip thinking, which is considered as a process of reflecting various properties of objects without considering the connections between them, characterised by the fragmentation of the flow of information, its illogic, heterogeneity, rapid changeability, lack of integrity of perception of the surrounding world (Sobolieva, 2019). Y. Zelenov & N. Sidash (2023) substantiated the following possible impacts of clip thinking on the worldview of the younger generation: the crisis of verbal text, the changing nature of socialisation, the possibility of a person losing the ability to comprehend and create new things, and a tendency to plagiarism. Accordingly, the researchers proposed to harmoniously combine clip and conceptual thinking.

The analysis of scientific studies on the problem of learning revealed an unwavering interest in various aspects of human mental activity and attempts to study its individual components. Despite this, psychology still lacks studies that would provide a detailed and comprehensive answer to the question of individual characteristics of the thinking process in students' age. According to the researchers, finding out the style of thinking of students will facilitate the choice of forms, methods, and techniques of teaching that will help optimise the educational process. The style of thinking is understood as the individual specific features of its organisation, the specificity of the expression of certain mental qualities, the preference for operating certain mental operations over others, which affects the course and quality of solving various problems. Therefore, the purpose of this study was to examine the specific features of students' thinking activity and to identify (based on the analysis of the findings) the characteristics of their style. The scientific originality of this study lies in the empirical substantiation of the essence of the style of thinking activity of students and the description of its characteristics. The above analysis of scientific studies on the subject led to the choice of methods for investigating the complex of characteristics of students' thinking activity for further allocation of its style characteristics.

Materials and Methods

According to the outlined objectives, the study was conducted in three stages: the first stage was a pilot study, during which the selected set of methods was tested, the second stage was an empirical study of the characteristics of students' thinking activity, and the third stage was an analysis of the results and description of the characteristics of the style of thinking activity of students.

The empirical study employed a set of the following methods:

1. The L. Starkley Critical Thinking Test (adapted by O. Lutsenko (2014)) – to identify the level of development of critical thinking in general and its features: the ability to focus observations for effective problem solving, inductive thinking, persuasion techniques, logical errors, the ability to think in multiple ways, the influence of emotions on thinking, the ability to find relevant information resources, focus observations for effective problem solving, maintain attention to avoid logical errors, the ability to form problematic judgements, the ability to distinguish explanations from arguments, and use them correctly.

2. Test of creative thinking E. Torrance (1962) (verbal battery, classic version) – to study the creative productivity of the verbal thought process. The methodology diagnosed the following indicators of creative thinking: a) speed – the ability to generate numerous ideas (associations, images) in verbal form. It is measured by the number of results; b) flexibility – reflects the ability to produce multiple ideas, move from one aspect of the problem to another, and use various solution strategies. It is measured by the number of categories; c) originality – characterises the ability to produce ideas that are different from the clear, normative ones. Original solutions require the ability to refrain from producing the first answer that comes to mind, which is usually simple and standard. It is measured by the number of extraordinary answers, images, ideas.

3. L. Rebekka's Cognitive-Activity Style Diagnostic Test (activity type 5) – to determine the style of operating with ideas: synthesis or analysis.

4. Methodology for determining the type of thinking and level of creativity by S. Dmytriyeva – to identify the prevalent type of thinking: subject-action, abstract-symbolic, verbal-logical, visual-figurative, creativity.

5. Methodology "Register of information learning style" by A. Gregos – to identify the leading ways of collecting various information (professional, cognitive, life). This methodology can be used to diagnose the learning style preferred by the examinee: concrete-sequential, abstract-arbitrary, abstract-sequential, concrete-arbitrary.

6. Methodology for studying the analytical thinking (variant VI subtest of the R. Amthauer scale, 1953) – to diagnose the level of analytical thinking as a characteristic of thinking.

7. The method of studying the reflexivity of thinking – to diagnose the level of reflection of thinking, which allows developing the most effective strategy and accelerate thinking activity when solving problems.

8. Methodology for investigating the influence of attitude on the way of solving problems – to determine the rigidity and flexibility of thinking.

9. Questionnaire "Thinking Styles" by A. Harrison & R. Bramson – to identify a person's preferred way of thinking, manner of asking questions and making decisions. The methodology assumes the existence of the following thinking styles: synthesiser, idealist, pragmatist, analyst, realist.

The following methods of mathematical processing were used to analyse the findings: frequency analysis, calculation of averages and standard deviations, Fisher's angular transformation with pairwise comparison of groups, Student's t-test, factor analysis. The data were processed using SPSS.24.0 software. The description of the characteristics of the style of thinking activity of students was made based on the structural interpretive method.

This study was conducted following the principles of APA (American Psychological Association, 2024) for human research. The students were offered a Google form with a set of methods approved by the Ethics Committee of the Department of Psychology of the National University of Life and Environmental Sciences of Ukraine. The study was anonymous, the participants were informed that their answers would be treated confidentially, anonymously, all data would be analysed confidentially, anonymously, all data would be analysed in a generalised form without any conclusions about individual respondents. Participation in the study was voluntary. The respondents were full-time students of the 1st-4th year of bachelor's and 1st-2nd year of master's degrees in various specialities of the National University of Life and Environmental Sciences of Ukraine, Ivan Puluj National Technical University of Ternopil, Yuriy Fedkovych National University of Chernivtsi, totalling 296 people. The study was conducted in the spring of 2024.

Results and Discussion

The following findings were obtained during the study. According to the L. Starkley Critical Thinking Test, the vast majority of students have an average level of critical thinking (Table 1).

Table 1. *Indicators of the level of critical thinking of the respondents*

Groups of subjects	% of respondents with different levels of critical thinking					Subjects total, %
	Very high	High	Average	Low	Very low	
Boys	0	10.5	76.1	13.4	0	22.6
Girls	0.4	1.8	86.9	9.6	1.3	77.4
1st year	0	3.7	79	14.8	2.5	27.4
2nd year	1.05	6.4	78.7	12.8	1.05	31.8
3rd year	0	1.5	91.3	7.2	0	23.3

Table 1. *Continued*

Groups of subjects	% of respondents with different levels of critical thinking					Subjects total, %
	Very high	High	Average	Low	Very low	
4th year	0	0	97.3	2.7	0	12.5
Master's	0	6.7	86.6	6.7	0	5
Total in sample	0.34	3.72	84.46	10.47	1.01	100

Note: *frequency analysis data, n = 296*
Source: *experimental data*

Therewith, as presented in Table 1, this trend was observed in the study subjects regardless of gender and duration of study. The data of frequency analysis also suggested that boys were more likely to have higher rates of critical thinking than girls, and as for the duration of study at a higher education institution, the level of critical thinking of students grew with its increase. The application of Fisher's criterion with pairwise comparison of groups confirmed its partial reliability: when comparing the percentage of girls and boys with a level of critical thinking that exceeded the average level, the indicator $\varphi_{emp} = 2.61$ was obtained, which indicated a strong level of significance of differences ($p \leqslant 0.003$), and when comparing the percentage of students from year to year with a criticality level below the average, the φ_{emp} exceeded the critical values ($\varphi_{emp} = 1.77$) and reached the level of statistical significance ($p \leqslant 0.038$) only when comparing the data of the 2nd and 3rd year. Statistically significant were the differences between the first (1st, 2nd) and last (4th and Master's) year students in terms of the number of people with a level of criticality below the average – $\varphi_{emp} = 2.58$ at $p \leqslant 0.004$.

These findings suggested that the majority of students have a significant number (30-70%) of critical thinking skills – logic, induction, and deduction, the ability to critically analyse information, the ability to resist manipulation to an average degree (possibly not immediately recognising it), control emotions and understand their effects on decision-making. At the same time, these abilities still need to be developed, because such people did not correctly recognise 30% to 70% of the techniques of persuasion, distraction, and false conclusions, did not choose the optimised solution, and trusted insufficiently reliable sources of information, which was modelled in the test. For such individuals, the number of optimum solutions may be approximately equal to the number of unsuccessful solutions, but based on the knowledge of successful solutions, they may not recognise the lack of efficiency and limitations of their thinking. Therefore, students should definitely devote time and energy to its development, as it can become a serious growth potential. Therewith, greater attention should be paid to the development of critical thinking among girls and 1st-2nd-year students.

According to the creative thinking test by E. Torrance (1962) revealed indicators of speed, flexibility, and originality of thinking (Table 2).

Table 2. *Indicators of creative thinking of the respondents*

Groups of subjects	Indicators of creative thinking					
	Speed of thinking		Flexibility of thinking		Originality of thinking	
	M	Σ	M	Σ	M	σ
Boys	23.7	22.79	20.55	16.04	16.3	16.04
Girls	23.07	17.37	21.4	14.83	16.64	14.83
1st year	18.12	11.94	16.62	10.65	12.91	9.85
2nd year	21.18	19.42	19.17	16.02	15.11	16.02

Table 2. *Continued*

Groups of subjects	Indicators of creative thinking					
	Speed of thinking		Flexibility of thinking		Originality of thinking	
	M	Σ	M	Σ	M	σ
3rd year	27.46	20.65	24.99	16.71	19.03	16.71
4th year	32.02	17.71	28.86	13.99	22.3	13.99
Master's	24.6	27.1	22.53	21.35	19.8	21.35
Sample in total	23.21	18.7	21.21	15.08	16.56	15.08

Note: *descriptive statistics data, n = 296*
Source: *experimental data*

Since the methodology was not adapted to the Ukrainian sample, the obtained indicators were not compared to the normative ones, but their expression within the selected subgroups was compared. The numerical values of σ indicated in Table 2 indicate a fairly strong level of variability in the indicators of speed, flexibility, and originality of thinking both in the sample in total and within the selected subgroups.

Therewith, both in the sample in total and in its individual groups, the highest indicators were those of speed of thinking, and the lowest ones were those of originality of thinking. The average values of the studied parameters of creative thinking in the selected subgroups differed, with a tendency to increase from one year to another at the bachelor's level. However, their sequential analysis (comparison of groups by gender, 1st and 2nd, 3rd and 4th, 4th and 5th years) using Student's t-test revealed statistically significant differences only in the speed of thinking of 2nd and 3rd year students ($t = 1.97$ at $a \leqslant 0.05$). The application of this criterion to compare the indicators of creative thinking in 1st and final year bachelor's students confirmed the statistical significance of differences in speed ($t = 4.34$ at $a \leqslant 0.001$), flexibility ($t = 4.88$ at $a \leqslant 0.001$), and originality ($t = 3.69$ at $a \leqslant 0.001$) of thinking, which is explained by their growth with the experience of studying at a higher education institution. That is, although the growth of the ability to generate many ideas in verbal form, to put forward a variety of ideas, to move from one aspect of the problem to another, to use various solution strategies, to put forward ideas that differ from the normative ones may be little noticeable from year to year, it becomes clear when comparing students of the initial and final stages of study.

According to the L. Rebekka cognitive-activity style diagnostic methodology, it was found that the majority of students had a synthetic style of operating with ideas over the analytical one (Table 3).

Table 3. *Distribution of subjects by indicators of prevalence of thinking operations*

Groups of subjects	Distribution of subjects, %		
	Synthesis prevails	Analysis prevails	Balanced analysis and synthesis
Boys	45	45	10
Girls	56	32	12
1st year	46	28	12
2nd year	55	32	13
3rd year	50.7	40.6	8.7
4th year	54	35	11
Master's	46.7	40	13.3
Sample total	53	35	12

Note: *frequency analysis data, n = 296*
Source: *experimental data*

Such trend was observed in each year and in the group of girls, but in the group of boys, both analysis and synthesis were prevalent with equal frequency. Therewith, the application of Fisher's angular transformation criterion helped to establish that the proportion of girls with synthesis prevalence did not significantly exceed that of boys (φ_{emp} = 1.58 at p ⩽ 0.057). Thus, the data obtained suggested that most students tended to think in general categories, easily grasp the central idea, general meaning, and connection, even if they did not know all the words in the concepts of the topic being taught. Therewith, there was also a considerable proportion of students who focused on their partial contrast and logical analysis, who did not have a clear picture. Only a small proportion of students could easily operate with general categories and logical analysis of details.

According to the methodology for determining the type of thinking and the level of creativity, it was found that the majority of the sample is characterised by a high level of object-action, an average level of abstract-symbolic, an average level of verbal-logical, a high level of visual-figurative thinking, and a high level of creative thinking (Table 4). This tendency was observed in all groups of subjects, except for the prevalence of students with a high level of verbal and logical thinking in the 4th year and an average level of creative thinking in masters.

Table 4. *Distribution of respondents by indicators of prevalence of the type of thinking*

Group of subjects	% of subjects with different levels of subject-action thinking			% of subjects with different levels of abstract-symbolic thinking			% of subjects with different levels of verbal-logical thinking			% of subjects with different levels of visual-figurative thinking			% of respondents with different levels of creative thinking		
	Low level	Average level	High level	Low level	Average level	High level	Low level	Average level	High level	Low level	Average level	High level	Low level	Average level	High level
Boys	3	51	46	34	51	15	10	63	27	3	48	49	1.5	40.3	58.2
Girls	0.9	45.4	53.7	41.5	48.9	9.6	7.4	54.6	38	1.8	21.8	76.4	1.3	39.3	59.4
1st year	1.2	46.9	51.9	27	59	14	5	60	35	1.2	28.4	70.4	0	42	58
2nd year	2.1	47.9	50	46.8	44.7	8.5	12.8	60.6	26.6	3	33	64	2	35	63
3rd year	0	45	55	45	45	10	6	49	45	1.5	24.6	73.9	0	42	58
4th year	0	46	54	37.8	48.7	13.5	8	43	49	2.7	21.6	75.7	2.7	32.4	64.9
Master's	6.6	46.7	46.7	46.7	46.7	6.6	6.6	66.7	26.7	0	20	80	6.7	60	33
Sample in total	1.4	46.6	52	40	49	11	8	56	36	2	28	70	1.4	39.5	59.1

Note: *frequency analysis data, n = 296*
Source: *experimental data*

The data in Table 4 suggest that among girls there was a greater proportion of those with a high level of object-action, verbal-logical, and visual-figurative thinking; a greater proportion with a low and smaller proportion with a high level of abstract-symbolic thinking; and in terms of the distribution of levels of creative thinking, boys and girls were approximately the equal. Its verification using the Fisher's angular transformation criterion confirmed the presence of significant differences in the percentage of boys and girls with a low level of abstract-symbolic thinking (φ_{emp} = 1.84 at p ⩽ 0.033), high verbal-logical (φ_{emp} = 1.69 at p ⩽ 0.046), and visual-figurative thinking (φ_{emp} = 4.15 at p ⩽ 0.001). Thus, boys and girls arguably had approximately the same distribution of diverse types of thinking, but boys were significantly less likely to have low levels of abstract and symbolic thinking, while girls were significantly more likely to have high levels of verbal and logical and visual and imaginative thinking.

According to the methodology "Register of Information Acquisition Style" by A. Gregos, the distribution of the subjects by the prevalence of the method of collecting various information (professional, cognitive, life) was revealed – concrete-sequential, abstract-arbitrary, abstract-sequential, concrete-arbitrary, mixed (Table 5).

Table 5. *Distribution of the research subjects by indicators of prevalence of the information acquisition style*

Groups of subjects	% of respondents with the prevalence of concrete-sequential style	% of subjects with a prevalence of abstract-arbitrary style	% of subjects with a prevalence of abstract-sequential style	% of subjects with a prevalence of concrete-arbitrary style	% of subjects with the prevalence of mixed style
Boys	29.9	9	32.8	13.4	14.9
Girls	28	12	20	18	22
1st year	26	9	27	22	16
2nd year	28	14	18	16	24
3rd year	29	9	17	22	23
4th year	27	8	35	8	22
Master's	46.6	26.7	26.7	0	0
Sample in total	28.4	11.1	23	17.2	20.3

Note: *frequency analysis data, n = 296*

Source: *experimental data*

The data in Table 5 suggest that the sample in total and each of its groups had students with various prevalent styles of information acquisition. Therewith, in the sample in total and in most groups, the proportion of people with the prevalent concrete-sequential style of information acquisition was greater, while in the groups of boys, 1st- and 4th-year students – abstract-sequential. The difference in the percentage of boys and girls with a prevalent abstract-sequential and mixed style of information acquisition is noteworthy. The application of the Fisher's angular transformation criterion indicated statistical significance of the difference in the prevalence of the abstract-sequential style of information acquisition (φ_{emp} = 2.11 at p ⩽ 0.017) and its absence in the mixed style. Thus, among boys, the prevalence of the abstract-sequential style of information acquisition was significantly more frequent than among girls, which ensured separation, analyticality, logic, abstractness, evaluation, and rationality in the perception of information.

The methodology for studying analytical thinking revealed the prevalence of the proportion of students with an average level of analytical thinking in the sample in total, among boys and girls, but the unequal distribution of the percentage of students with various levels of its development in different years of studying (Table 6).

Table 6. *Distribution of respondents by indicators of analytical thinking*

Groups of subjects	M level of analytical thinking	σ	% of respondents with a low level of analytical thinking	% of respondents with an average level of analytical thinking	% of respondents with a high level of analytical thinking
Boys	6.93	4.47	34	45	21
Girls	7.42	4.93	34.5	35	30.5
1st year	6.14	4.89	45.7	35.8	18.5

Table 6. *Continued*

Groups of subjects	M level of analytical thinking	σ	% of respondents with a low level of analytical thinking	% of respondents with an average level of analytical thinking	% of respondents with a high level of analytical thinking
2nd year	7.14	4.92	39	30	31
3rd year	7.93	4.2	23	51	26
4th year	8.89	4.64	19	38	43
Master's	7.87	6.16	33	27	40
Sample in total	7.3	4.1	35	37	28

Note: *descriptive statistics and frequency analysis data, n = 296*
Source: *experimental data*

Table 6 demonstrates the prevalence of students with low levels of analytical thinking in the 1st and 2nd years of study, with an average level in the 3rd year and a high level in the 4th year and among master's students, an increase in the average values of the analytical thinking indicator from the 1st year to the 4th year with a considerable dispersion of indicators in the selected groups, as well as differences in the frequency of high levels of analytical thinking between boys and girls. The Student's t-test was employed to verify the statistical significance of the differences in the mean values of the indicators of analytical thinking of students of different years, but no significant differences were found from year to year. To test the reliability of differences in the frequency of high levels of analytical thinking between girls and boys, the Fisher's angular transformation criterion was applied. However, no significant differences were found ($\varphi_{emp} = 1.57$ at $p \leqslant 0.058$).

The methodology for studying reflexivity of thinking revealed the proportion of students with its high level both in the sample in total and in each of the selected groups, with differences in the dispersion of the indicator values in the groups (Table 7).

Table 7. *Distribution of the subjects by indicators of reflective thinking*

Groups of subjects	M level of reflective thinking	σ	% of subjects with a low level of reflective thinking	% of respondents with an average level of reflective thinking	% of respondents with a high level of reflective thinking
Boys	8.84	4.99	25.4	31.3	43.3
Girls	11.03	4.54	11	25	64
1st year	9.42	5.26	25	22	53
2nd year	10.26	4.5	13	32	55
3rd year	11.8	3.72	1	32	67
4th year	12.27	3.54	5	19	76
Master's	8.2	7.02	40	13	47
Sample in total	10.5	4.67	14	27	59

Note: *descriptive statistics and frequency analysis data, n = 296*
Source: *experimental data*

Table 7 shows an increase in the average value of reflectivity from year to year among bachelor's students, as well as differences in the average values of the reflectivity indicator for boys and girls and in the percentage of boys and girls with a high level of reflectivity. The Student's t-test was employed to verify the reliability of differences in the mean values of reflectivity

indicators of students of different courses and genders. The application of the Student's t-test revealed statistically significant differences in the level of reflexivity of boys and girls (t = 3.2 at a ⩽ 0.001), but did not reveal significant differences in the average level of reflexivity between students of different years (1st and 2nd, 2nd and 3rd, 3rd and 4th, 4th and Master's).

The application of the Fisher's angular transformation criterion showed that the percentage of girls with a high level of reflexivity is statistically significantly greater than that of boys (φ_{emp} = 3.02 at p ⩽ 0.001). Thus, most students were characterised by a high level of reflective thinking, which allows developing the most effective strategy and accelerate thinking activity when solving problems. Therewith, among girls, a high level of reflective thinking was significantly more frequent.

According to the methodology of studying the influence of attitude on the way of solving problems, the following indicators of students' rigidity and flexibility of thinking were revealed (Table 8).

Table 8. *Distribution of subjects by indicators of rigidity/flexibility of thinking*

Groups of subjects	% of respondents with flexibility of thinking	% of subjects with rigidity of thinking
Boys	19	81
Girls	21	79
1st year	9	91
2nd year	21	79
3rd year	29	71
4th year	27	73
Master's	27	73
Sample in total	21	79

Note: *frequency analysis data, n = 296*
Source: *experimental data*

The data in Table 8 indicate that most students, regardless of gender and duration of study at a higher education institution, were characterised by rigidity of thinking, which manifested itself in difficulties in switching from one way of solving problems to another. According to the questionnaire "Thinking Styles" by A. Harrison & R. Bramson, the following indicators of the desired way of thinking, manner of asking questions, and making decisions were diagnosed (Table 9).

Table 9. *Distribution of respondents by indicators of their preferred style of thinking*

Groups of subjects	% of respondents with the desired style of thinking					
	Synthesiser	Idealist	Pragmatist	Analyst	Realist	Mixed type
Boys	7.5	7.5	4.5	44.7	19.4	16.4
Girls	8	10.9	10	33.6	17	20.5
1st year	5	9	4	34	12	17
2nd year	11	12	8.5	25.5	23	20
3rd year	4	6	13	38	19	20
4th year	8	16	11	46	8	11
Master's	13	0	7	40	13	27
Sample in total	8	10	9	36	17.5	19.5

Note: *frequency analysis data, n = 296*
Source: *experimental data*

The data in Table 9 show that students identified distinct types of thinking styles as desirable for themselves, but the most frequently preferred thinking style was analytical both in the sample in total and in its individual groups. Therewith, boys chose this style of thinking more often than girls. The application of Fisher's angular transformation criterion confirmed the statistical significance of such differences ($\varphi_{emp} = 1.64$ at $p \leqslant 0.05$). That is, students were more likely to choose a style of thinking that uses a deductive approach, strive for models and formulas, express interest in "scientific solutions", pay attention to practical data and concrete details, and are better equipped to navigate structured, calculable situations. At the same time, there may be a tendency to polarised "black and white" thinking, inflexibility, and excessive demands for predictability.

To find out the most significant characteristics of students' thinking activity, the empirical data obtained were analysed using the factor analysis method. As a result, 8 factors were obtained, describing 66% of the sample (Table 10).

Table 10. *Selected factors and their components*

Characteristics of thinking activity – components of factors	Factors							
	1	2	3	4	5	6	7	8
Criticality of thinking	.309	-.218	.449	-.152	-.046	.020	.074	.352
Speed of thinking	.817	-.394	-.287	-.004	-.019	.000	-.116	.000
Synthesis indicator	.136	.306	-.051	.121	.153	.129	.332	.115
Analysis indicator	.464	-.200	-.374	-.169	.067	.067	-.054	.007
Subject-action	.135	.122	.056	.612	-.086	.131	-.153	-.212
Abstract-symbolic	.193	.160	.189	-.002	.528	.259	-.099	-.095
Verbal-logical	.398	.352	-.030	-.213	.251	.124	.380	.275
Visual-figurative	.330	.278	-.049	.070	.353	-.086	.424	.271
Creativity	.209	.238	-.024	.599	.017	.023	-.090	-.111
Concrete-consistent style	.402	.682	-.058	-.065	-.119	-.094	-.033	-.072
Abstract-arbitrary style	.415	.740	.039	-.060	-.142	-.057	-.082	-.032
Abstract-sequential style	.423	.601	.206	-.189	-.150	-.118	-.226	-.046
Concrete-arbitrary	.381	.625	.189	-.086	-.267	-.104	-.054	-.098
Analyticality of thinking	.337	-.311	.458	.196	.037	.280	.191	-.110
Reflectivity of thinking	.382	-.145	.420	.292	-.214	.058	.217	-.129
Rigidity/flexibility of thinking	.206	-.175	.312	.300	-.048	-.024	.309	-.072
"Synthesiser" style	-.119	.200	-.140	.385	-.130	.327	-.340	.684
"Idealist" style	-.100	.294	-.405	-.057	.348	.384	.082	-.459
"Pragmatist" style	-.072	-.049	-.447	.176	-.370	-.442	.471	-.033
"Analyst" style	.153	-.185	.513	-.009	.483	-.568	-.255	-.035
"Realist" style	.086	-.187	.346	-.452	-.441	.440	.088	-.109
Flexibility of thinking	.822	-.407	-.271	-.004	-.021	-.015	-.103	.000
Originality of thinking	.825	-.410	-.292	-.015	-.010	-.003	-.133	-.009

Note: *frequency analysis data, n = 296*

Source: *experimental data*

The data in Table 10 demonstrate the completeness of the factors with the following principal components (determined by their maximum loadings within the factors):

- factor 1: speed of thinking, analysis, verbal and logical thinking, flexibility and originality of thinking;
- factor 2: concrete-sequential style, abstract-arbitrary, abstract-sequential, concrete-arbitrary;
- factor 3: critical thinking, analytical thinking, reflective thinking, preferred style of thinking "analyst";
- factor 4: subject-action thinking, creativity of thinking, undesirable style of thinking "realist";
- factor 5: abstract and symbolic thinking;
- factor 6: undesirable style of thinking "analyst", desirable – "realist";
- factor 7: synthesis, visual and figurative thinking, rigidity/flexibility of thinking, preferred style of thinking "pragmatist";
- factor 8: preferred style of thinking "synthesiser", undesirable "idealist".

According to the data on the maximum load of components within the identified factors and their semantic interpretation, the factors were named as follows:

- factor 1 – creativity of the style of thinking;
- factor 2 – style of perception of information;
- factor 3 – style of information evaluation;
- factor 4 – style of information transformation;
- factor 5 – style of operating with symbols;
- factor 6 – style of orientation of the thinking process (on the result);
- factor 7 – style of orientation to the quality of the result;
- factor 8 – activity of the thinking process (focus on the search for alternatives).

Thus, the procedure of factor analysis helped to reduce the large dimensionality of the data and structure the characteristics of thinking activity by eight factors that reflect various aspects of the style of the thinking process. The data obtained served as the basis for a systematic description of the style characteristics of students' thinking activity. Specifically, this study identified a series of style characteristics of students' thinking activity.

In terms of creativity in the style of thinking, a high level of variability in the indicators of speed, flexibility, originality of thinking, and their growth in the last year of study compared to the first year (i.e., with increasing learning experience, students' ability to generate a considerable number of ideas in verbal form, to put forward a variety of ideas, to move from one aspect of the problem to another, to use various solution strategies, to put forward ideas that differ from the normative ones); the tendency of the majority to think in general categories, to easily grasp the main idea, general meaning and connection without going into details; well-developed verbal and logical thinking in the vast majority of students.

In the context of information perception style: resorting to different styles of information acquisition, the majority – to concrete and consistent (i.e., tend to show fascination, receptivity, sensitivity, acceptance, intuitiveness, specificity, focus on the present, openness to new things, experience, intensity). Therewith, the prevalence of the abstract-sequential style of information acquisition was much more frequent among boys than among girls, which ensures separation, analytical, logical, abstract, evaluative, rationality in the perception of information.

In the style of information evaluation, the study found the prevalence of an average level of critical thinking (i.e., the majority of students had a significant number (30-70%) of critical thinking skills – logic, induction, and deduction, the ability to critically analyse information, the ability to resist manipulation, control emotions and awareness of their effects on decision-making), an increase in criticality among senior students compared to the first year students; furthermore, high levels of critical thinking were more frequent among boys than girls; diversity of levels of analytical thinking, regardless of the period of study at a higher education institution and gender; a high level of reflexivity of thinking, which helps to develop the most effective strategy and accelerate thinking activity when solving problems, while among girls a high level of reflexivity of

thinking is much more common; the most desirable style of thinking is analytical (and for boys more than for girls), which uses a deductive approach, a desire for models and formulas, an interest in "scientific solutions", practical data, and specific details, and orientation in structured situations.

In terms of the style of information transformation: well-developed subject-action thinking, i.e., thinking that provides cognition through movements, its high level for most students regardless of age and gender; well-developed creative thinking, which helps to find non-standard solutions; undesirability for the vast majority of "realist" style of thinking, which uses an empirical, inductive approach, focus on concrete results.

In the study of the style of operating with symbols, it was noted that abstract and symbolic thinking reached a high level of development in a small part of students, about half had an average level of development, a little less than half – a low level, while girls had a low level of development significantly more often than boys. That is, most students had difficulties with mathematical codes, formulas, and operations.

In terms of the style of orientation of the thinking process (on the result): a greater focus on the deductive approach than the inductive one. A considerable number of students, especially girls, did not identify a way of thinking that involves a formal-logical approach, focused on the use of models and formulas, and attention to detail as desirable. As a result, they may have difficulty planning, not considering concrete details and practical data. A small proportion of students employed the "realist" style of thinking, i.e., they relied more on their experience, facts and opinions of experts, were interested in concrete results, and tended to adjust their conclusions.

As for the style of focusing on the quality of the result: prevalence of the tendency to think in general categories, to easily grasp the main idea, general meaning and connection, even if they do not know all the words in the concepts of the topic under study; high level of visual and figurative thinking, which is closely related to imagination (its high level was significantly more common in girls than in boys); insufficient flexibility of thinking, which is manifested in the difficulty of switching from one way of solving problems to another; pragmatic thinking in a small proportion of students, which is manifested in interest in innovation, the desire to get the most out of the shortest possible time, and to apply an eclectic approach to solving problems.

The analysis of the activity of the thinking process (orientation towards the search for alternatives) revealed the following: a tendency of a small proportion of students to propose alternative solutions, to notice contradictions, manifestation of fact-centredness, focus on available data in most students.

The findings of the empirical study described above and their analysis correlated with the results of studies by other researchers – both Ukrainian and psychological researchers from other countries. Specifically, N. Akimova *et al.* (2022) argued that the greater the level of speech and thinking development in adolescence, the more active the reading of texts, the better the prediction of their content from pictures and interpretation. The current study found that the indicators of creative thinking (speed, flexibility, originality) form one factor in students' thinking along with mental analysis and verbal-logical thinking, which is consistent with the above data.

When considering cognitive styles in the context of self-preservation behaviour N. Pyliavets (2023) empirically found that self-preservation behaviour is associated with analytical and reflective thinking. The researcher obtained the following indicators of reflexivity and analytical thinking on a sample of 130 students of the Vinnytsia Academy of Continuing Education: none of the respondents showed a pronounced analytical thinking, 21.54% of respondents had a low level of reflexivity, 36.92% had a high level, and 51.54% had an average level. In the current study, somewhat different indicators were obtained: a significant proportion of students with a high level of analytical thinking was found – 28%; as for

reflective thinking, the smallest proportion also included students with a low level – 14%, but the largest proportion was the share of people with a high level – 59%.

E. Balashov & V. Kalamazh (2020) described the features of reflective skills at the cognitive level and students' reflective abilities to self-regulation, which they use when solving a problem. The researchers noted that the overall level of the subjects' reflective abilities at the cognitive level was average. In the current study, the average reflexivity index obtained in the sample reached a high level, which may further indicate individual differences in the style characteristics of students' thinking activities.

I. Kariaka *et al.* (2020) investigated the specific features of the manifestation of thinking styles in the communication activities of young men. The following types of thinking were diagnosed: synthetic (synthesiser), idealistic, pragmatic, analytical, realistic, and compared with their manifestations in communication. The study was conducted on a small sample (40 people) and the following distribution of respondents by prevalent thinking styles was obtained: 35% had a realistic style of thinking, 30% – analytical, 20% – pragmatic, 10% – idealistic, 5% – synthetic. In the current study, this distribution differed in terms of realistic (only 17.5% of respondents had a realistic style of thinking) and pragmatic styles (only 9%) and was comparable in terms of analytical (36%), idealistic (10%), and synthetic (8%) styles of thinking.

The findings obtained by the methodology for determining the type of thinking and the level of creativity are in line with the results of the study of students' types of thinking by T. Lysianska (2020). Specifically, the researcher paid attention to the following types of thinking: substantive, figurative, iconic, and symbolic. In an empirical study, T. Lysianska (2020) found that most students have symbolic thinking, which is based on subject-figurative thinking. The current study also found that most subjects (70%) had a high level of visual-figurative thinking, and almost all the rest have an average level. Factors 2 (style of information perception) and 4 (style of information transformation) obtained in this study correlated with the understanding of the essence of cognitive style accepted in psychological science: cognitive style is a model of human processing of cognitive tasks, their perception, memorisation, and thinking (Sender, 2020). The researcher experimentally proved that the effectiveness of students' (future engineers') learning activities was directly related to the compliance of the learning strategy with their cognitive style. In the present study, the researchers proceeded from an analogous idea: the compliance of teaching methods, tools, and techniques with the style characteristics of students' thinking activities would contribute to the better effectiveness of the educational process.

Conclusions

The theoretical analysis of the problem of specific features of students' thinking activity, as well as the analysis of the findings of the empirical study, helped to formulate a series of conclusions about the style of thinking activity of students and its characteristics. Specifically, the style of thinking activity of students is a systemic characteristic of their thinking activity, which includes indicators of creativity of thinking, specific features of perception, evaluation, and transformation of information, operation with symbols, orientation of the thinking process to the result and its quality, activity of the thinking process (its focus on finding alternatives, operating with factual data). Due to the representation of the style of thinking activity of students by a considerable number of indicators, there was a wide variety of style characteristics of students' thinking activity. According to some style characteristics of thinking activity, most students are similar: an average and higher level of critical thinking, well-developed subject-action, verbal-logical, visual-figurative style of thinking and creativity.

Differences in the style characteristics of thinking activity of boys and girls of student age were as follows: boys were more likely than girls to have high rates of critical thinking, to choose

an analytical style of thinking, to prefer an abstract and sequential style of information acquisition, which ensures separation, analytical, logical, abstract, evaluative, rationality in the perception of information; a low level of abstract and symbolic thinking was much less frequent than in girls; girls were much more likely to have a high level of verbal-logical and visual-figurative thinking, a high level of reflexivity of thinking.

Differences in the style characteristics of students depending on the period of study at a higher education institution were manifested in a decrease in the proportion of students with a low level of criticality in the senior year of a bachelor's degree compared to the first year, in the growth of indicators of speed, flexibility, and originality of thinking in the senior year of a bachelor's degree compared to the first year. To ensure the effectiveness of learning, it is vital to consider the style characteristics of students' thinking when teaching and formulating tasks for independent work. The development of recommendations for the consideration of the style characteristics of students' thinking activity in the educational process and testing their effectiveness constitute the essence of further research.

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Conflict of Interest

None.

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Характеристика стилю мисленнєвої діяльності студентської молоді

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Анотація. Необхідність оптимізації освітнього процесу в закладах вищої освіти з огляду на вимоги часу зумовлює важливість урахування психологічних характеристик його учасників. Значущість мисленнєвої діяльності особистості в навчанні та недостатня розробленість проблеми її особливостей у сучасної студентської молоді зумовили мету дослідження авторів – виявити стильові характеристики мисленнєвої діяльності студентської молоді. У статті висвітлені результати емпіричного дослідження стильових характеристик мисленнєвої діяльності студентської молоді, проведеного за допомогою низки психодіагностичних методик. Проаналізовано дані, отримані за кожною із методик у вибірці загалом та в межах таких груп: хлопці, дівчата, студенти першого курсу, другого курсу, третього курсу, четвертого курсу, магістратури. За допомогою методів математико-статистичної обробки даних з'ясовано достовірність відмінностей між групами за рівнями розвитку окремих характеристик мисленнєвої діяльності. У результаті застосування факторного аналізу виокремлено вісім факторів, за якими структуровано опис стильових характеристик мисленнєвої діяльності студентської молоді: креативність стилю мислення, стиль сприймання інформації, стиль оцінювання інформації, стиль перетворення інформації, стиль оперування символами, стиль орієнтування мисленнєвого процесу (на результат), стиль орієнтування на якість результату, активність мисленнєвого процесу (орієнтованість на пошук альтернатив). На підґрунті аналізу емпіричних даних зроблено висновок про системну сутність стилю мисленнєвої діяльності студентської молоді, різноманітність стильових характеристик мисленнєвої діяльності студентства, наявність схожих та відмінних характеристик стилю мисленнєвої діяльності у студентів різних курсів та різних статей. Практична цінність отриманих результатів полягає у можливості їх використання для вдосконалення методики викладання у закладах вищої освіти, у розумінні причин труднощів окремих студентів у навчанні, в орієнтації підбору психодіагностичного інструментарію у випадку необхідності з'ясування характеристик окремих параметрів стилю мисленнєвої діяльності

Ключові слова: креативність мислення; стиль сприймання інформації; стиль мисленнєвого оцінювання інформації; психологічні характеристики; оперування символами у мисленнєвому процесі; оптимізація навчального процесу

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Synergetics and the problem of objectivity in scientific knowledge

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Abstract. The relevance of this article was determined by the significance of objectively understanding nonlinear, chaotic systems, which are a product of the dynamic nature of modern science and are addressed by synergetics. The study aimed to conduct a theoretical investigation into the objectivity of scientific knowledge by employing synergetics as a non-traditional scientific paradigm within the contemporary philosophy of science and other interdisciplinary domains. The research methods applied included theoretical, historical, and interdisciplinary approaches, as well as mathematical modelling. It has been established that synergetics represents a meta-approach that emerged both as a response to the crises of the 20th and 21st centuries and as a consequence of globalisation, technological progress, and a shift in the perception of natural processes. It has been determined that synergetics, as a scientific discipline, and the synergetic approach, as an interdisciplinary method of scientific inquiry, enable an objective examination of non-equilibrium and nonlinear transformational processes due to the presence of a theoretical and mathematical framework. It has been generalised that the objectivity of scientific knowledge in synergetics is ensured by methods such as nonlinear thermodynamics of non-equilibrium processes, nonlinear oscillation theory in radio-technical systems, differential typology, catastrophe theory, tensor analysis, non-equilibrium statistical physics, qualitative theory of differential equations,

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and dynamical systems theory. It has been noted that the methodological and statistical framework of synergetics, as a universal method complementing cybernetics, is a composite approach incorporating elements from various fields of scientific inquiry. The study has demonstrated that within the synergetic paradigm, the concept of "chaos" has been reinterpreted, shifting from a destructive force to a creative source of alternative order through the process of self-organisation, which generates order from chaos. It has been indicated that synergetics represents a paradigm for the emergence of new qualities and provides a mathematical explanation of their development by applying nonlinear differential equations and bifurcation theory, which characterise the transition from quantitative changes to qualitatively new states. The practical significance of this study lies in presenting a new perspective on the objectivity of scientific knowledge, grounded in an understanding of the dynamics of self-organisation in complex systems, thereby facilitating the development of comprehensive approaches to addressing contemporary challenges within interdisciplinary frameworks

Keywords: synergetic paradigm; self-organisation of systems; open nonlinear systems; fluctuation; bifurcation; creative evolution

Introduction

If science is understood as an act of recognising reality, then the emergence of synergetics serves as evidence not only of changes in contemporary reality but also of shifts in human consciousness, marking the beginning of creative evolution (Gerasymchuk, 2024). The accumulation of knowledge, a natural consequence of the crises of the 20th and 21st centuries and the rise of non-classical science with its focus on systems thinking has led to a scientific revolution. This revolution was triggered by the breakdown of fundamental concepts familiar to classical science. The advent of cybernetics, thermodynamics, quantum theory, and both general and special relativity increasingly compelled humanity towards a change in awareness. This change involved a growing need to establish connections between diverse fields of knowledge, which, as argued by Ya. Tararoyev *et al.* (2023), has inexorably led to the necessity of finding systematic links between scientific knowledge, engineering, and technology.

In turn, the transformation of scientific knowledge, resulting from the shift in philosophical tendencies from the classical to the non-classical paradigm, has led to a decreasing emphasis on absolute objectivity in favour of a growing reliance on subjective research methods. At the same time, the tendency of non-classical science to incorporate subjective factors into research has influenced perspectives on the problem of objectivity in scientific inquiry. To some extent, researchers have increasingly prioritised theoretical methods and approaches to understanding reality, while also paying greater attention to examining the nature and impact of these methods. This shift has led to a decline in empiricism in studies concerning the essence of natural phenomena, reinforcing the transition of scientific inquiry towards purely theoretical epistemological pursuits. Consequently, in the modern world, the principles of pluralism and relativism have gained particular relevance, serving as a suitable foundation – or even a response to contemporary challenges – for the emergence and development of synergetics as an anti-crisis framework. As noted by L. Shumeiko (2023), such a framework may prove invaluable in addressing societal disillusionment with the concept of linear progress, fostering instead a greater focus on individualisation and a renewed interest in existentialism and personalism.

Thus, synergetics emerged in scientific inquiry not merely as a differentiated field of research but as a meta-approach – a response to

humanity's crisis of outdated worldviews, the understanding of natural processes, and the mental evolution driven by globalisation and technological progress. It may be said that the faster the world advances in its relentless development, the more individuals tend to deepen their perception of the interconnectedness of all things, embracing as "pure knowledge" the notion of a seamless unity between organic and inorganic nature, as reflected in F. Schelling's (1798) concept of the "world soul". In this sense, the discovery of synergetics in contemporary science can be seen as a means of taking a fresh breath of air – finding new meanings and foundations for constructing the science of the future. Alternatively, it may be interpreted as an expression of the collective unconscious striving for the realisation of creative evolution, driven by the desire to cultivate a new mode of thinking that enables a fundamental re-evaluation of worldviews and the evolution of objective reality. From the perspective of the authors of this study, the qualities inherent in synergetics – nonlinearity, openness, alternativeness, and instability – may well represent the essence of scientific knowledge. Synergetics has the potential to establish the rules for forming a coherent, internally consistent whole from diverse chaotic elements. It can synthesise the transformation of simple connections into complex ones, creating new forms of creativity, and analysing the unpredictability of pathways at bifurcation points. In doing so, synergetics creates a breakthrough in the metaphysics of knowledge, the so-called sphere of reason, which precedes the future development of the synergetics of the noosphere and fundamental ontology.

According to the concept of the Austrian scientist I. Prigogine, the father of synergetics, the main goal of the "neo-philosophy" embodied in the synergetic paradigm is the search for and discovery of new mechanisms of survival for the modern society and the society of the future (Prigogine & Stengers, 1984). After all, the very system of principles of the synergetic paradigm is primarily aimed at helping to overcome one-sidedness in solving the main social and educational contradictions. This new paradigm, in the authors' view, departs from previous ones in its approach to decision-making for any society or individual. It is characterised by a lack of adherence to the concept of a dichotomy between good and evil. Furthermore, this new paradigm does not attempt to rely on the illusory stability of existence, thereby creating a trajectory of development within the context of disordered chaos, multi-variance, and general disarray on the path to an inevitable encounter with bifurcation points (Morhun, 2019). Thus, the discovery of synergetics as a science characterises the individual as an active participant in the evolutionary process, reorienting the integration of knowledge and style of thinking into more humanistic and creative contexts of scientific knowledge. This article aimed to conduct a theoretical study of the relationship between synergetics and the objectivity of scientific knowledge, as well as an analysis of how the principles of synergetics influence the understanding of objectivity in the context of modern scientific approaches.

Literature Review

The analysis of recent studies and publications highlights the functional versatility of various aspects of synergetics as an interdisciplinary paradigm of a new methodology for scientific inquiry. Its practical applications extend across multiple fields of knowledge, including medicine, education, cybernetics, chemistry, philosophy, and the synergies among these disciplines. For instance, the study by N. Batechko (2016) explores the application of synergetic principles as a methodological tool for addressing contemporary complex challenges in education and for shaping national educational policy. Expanding on this research, N. Batechko & Y. Chuhayeva (2022) examine the response mechanisms of synergetic effects within complex information systems, particularly in the context of cyber threats and various forms of information attacks, focusing on resilience and adaptation processes. Meanwhile Gerasymchuk (2024)

investigates the impact of systemic crisis factors on transformations within the international system, employing a synergetic approach as a methodology for analysing destabilisation and adaptation processes in global politics.

As H. Birta & Yu. Burhu (2014) point out in their work, synergetics has been undergoing rapid development in recent times. It is a theory that studies the self-organisation and evolution of open systems of various natures: natural, social, and cognitive. The key concepts of synergetics are order, chaos, nonlinearity, instability, and uncertainty. These concepts are closely related to several philosophical categories, in particular being, development, becoming, time, integrity, chance and possibility, which contribute to their mutual penetration and integration. The book by V. Kamyshyn *et al.* (2018) is devoted to the use of synergetic approaches in the educational system, in particular in working with academically gifted students. It examines the theory of self-organisation and the development of open systems, which offers a methodology for understanding complex learning and development processes. The authors analyse the influence of key educational dominants and levels of aspirations on the effectiveness of the educational process. In particular, the interrelationships between students' self-esteem, their ability to make decisions and achieve a synergetic effect in learning are investigated. This approach not only improves the quality of education but also contributes to the development of individual talents and the creation of optimal conditions for their realisation.

The scholar O. Dzeban (2011) explores the synergetic approach as an effective methodology for analysing complex social systems. His study examines the role of synergetics in legal science, emphasising its importance for building effective legal systems that can adapt to modern challenges. The importance of self-organisation and harmonisation of legal norms in society is emphasised (Kovalenko & Bezverkha, 2018). Similarly, V. Nadurak (2014) examines the system of public morality through the prism of synergetics, in particular the interaction of moral principles as a complex nonlinear system that ensures social stability and development. Both works offer an innovative approach to understanding social phenomena, which is based on the ideas of self-organisation, nonlinearity and integration of different spheres of public life.

T. Kilochytska *et al.* (2023) analyse the use of synergetics as a method of scientific knowledge to explore the features of students' cognitive independence, paying considerable attention to self-organisation, as well as the process of adaptation to learning as a predictor of the development of cognitive abilities. The authors note the significance of the contribution of a multifaceted analysis of the synergetic approach to student interactions and self-organisation processes. O. Kutsyi (2022) examines the theoretical and practical features of synergy within the general scientific, as well as organisational and psychological dimensions, analysing synergy as an interdisciplinary phenomenon, emphasising the role of interaction processes between members of groups and organisations to achieve common goals. In his work, the author considers synergy as a fundamental principle for creating an effect that exceeds the sum of individual influences and contributions. The scholars A. Loburets *et al.* (2022) analyse the features of synergetics and selforganisation processes within the framework of the study of two-dimensional systems, focusing on the mechanisms aimed at controlling their inherent dynamics. The use of the principles of synergetics as scientific knowledge is used by the authors in their research to determine the genesis and patterns of its course in significant systems for ecology, biotechnology and chemistry.

I. Liashchenko (2020) in his article analyses culture as a complex dynamic system, considering it within the framework of the synergetic paradigm, subject to the principles of self-organisation, using the ability to consider culture as a nonlinear and complex system that is permanently between chaos and order. The problem of the metaphysical definition of unity and being in the

synergetic paradigm was studied by the author O. Morhun (2019). He analyses the connection between the process of unity of thinking and being, defining the relationship between thinking as a creative process and the objective reality of being, thereby integrating the synergetic paradigm of methodological research as a metaphysical analysis. In her study, O. Naumkina (2021) characterised the importance of post-non-classical science as an integration of modern research methods for analysing complex systems by creating transdisciplinary approaches, considering synergetics as a key determinant of the evolution of systems that are difficult or impossible to describe using classical research methods.

L. Shumeiko (2023) conducted an analysis of the principles of synergetics in the context of art education to optimise the learning process and the formation of democratic and flexible approaches to the organisation of the educational process, offering recommendations for the implementation of synergetics in the creative learning process. O. Parkhomenko *et al.* (2022) considered the importance of combining a systematic-creative approach with a synergetic approach to create natural self-regulation as a way of sustainable development of society against the background of the ecological crisis and other global challenges. Therefore, an analysis of modern publications on the topic of this publication illustrates synergetics as a powerful method of scientific knowledge for conducting interdisciplinary scientific research, which is aimed at providing a deep understanding of complex processes in technical, natural, educational and social systems of functioning, development and interaction.

Materials and Methods

In the creation of this article, the authors employed theoretical, historical, and comparative methods to investigate the problem of synergetics as the subject of objective scientific knowledge. As part of the theoretical analysis, 26 scientific studies were used and examined over the course of three months, forming the informational base of this research. The foundational work for investigating the issue of synergetics as the subject of objective scientific knowledge was the book by I. Prigogine & I. Stengers (1984), which embodies the essence of understanding the peculiarities of synergetics as a method of scientific knowledge. Other sources used in this study, forming the basis of the research, consist of scientific articles and books by both Ukrainian and international researchers, addressing various aspects of the study of synergetics as a science. They also explore the application of synergetics as a method of scientific knowledge across different fields, examining both practical and theoretical aspects of its use in addressing current issues in medicine, education, and other sectors. In writing the article, the authors analysed scientific sources published between 1984 and 2024, which allowed for a deep immersion into the investigated problem. The use of the theoretical method contributed to the formulation of the main research problem, aiming to illustrate the impact of synergetics on the objectivity of scientific knowledge.

For a more thorough investigation of the topic of synergetics as the subject of objective scientific knowledge, the authors also applied mathematical modelling methods and an interdisciplinary approach. This enabled a deeper analysis of the aspect of objectivity within the paradigm of this new scientific method, synergetics. The use of the historical method provided a detailed examination of the evolution of scientific theories of cognition – ranging from classical to modern scientific approaches such as synergetics. The comparative research method allowed the authors to highlight the distinctive features of synergetics in comparison with other methodologies of scientific knowledge. This, in turn, facilitated the systematisation of knowledge and the creation of the author's table. The interdisciplinary research method was employed to reveal

the universality of synergetics and to determine its significance within other fields of knowledge. The application of mathematical modelling characterised the use of mathematical tools in synergetics, which served to confirm the reliability and accuracy of the objectivity of scientific knowledge in the analysis of complex systems. Thus, a wide range of methods and materials was used in the creation of this article, allowing for an analysis of the problem of synergetics as the subject of objective scientific knowledge through comprehensive theoretical and mathematical analysis within a broad historical retrospective, as embodied in the variety of scientific research applied.

Results and Discussion

The relationship between synergetics and the objectivity of scientific knowledge

The term "synergetics" first appeared in the world in 1973 in a report entitled "Cooperative Phenomena in Strongly Nonequilibrium and Non-physical Systems", in which synergetics was presented as a theory of joint action, or, as it is known to modern scientific circles, the science of self-organisation. The emergence of this term belongs to the German researcher H. Haken (1977), who approached the emergence of synergetics while studying the coordination of the behaviour of atoms in a laser. Later, the researcher expanded the scope of this term and presented synergetics as a universal method of explaining phenomena in physics, chemistry, and biology. Thus, synergetics embodies a method of studying the spontaneous transition of non-equilibrium systems from less complex to more complex and more ordered forms of organisation of systems. Synergetics represents a new stage in the study of complex systems, expanding upon systems theory and complementing cybernetics (Kilochytska, 2014). A comparative analysis of the concepts of cybernetics, systems theory, and synergetics reveals key distinctions. Cybernetics, in essence, is aimed at ensuring the stability of systems through the application of negative feedback. Systems theory, meanwhile, focuses on investigating the principles of their organisation. Synergetics, in contrast, concentrates on studying the features of non-equilibrium and instability of the natural state of open nonlinear systems, as well as the multi-level nature and ambiguity of their evolutionary paths. Thus, synergetics studies the types of behaviour of such systems, which represent non-stationary structures that arise under the influence of external factors or as a result of internal factors, such as fluctuations.

The foundation of objective scientific knowledge, embodied in the methodological-statistical apparatus of synergetics, consists of the ideas and methods of nonlinear thermodynamics of nonequilibrium processes, the achievements of nonlinear theory of oscillations in radio-technical systems, qualitative theory of differential equations, and a substantial mathematical apparatus within the theory of dynamic systems. Thus, the mathematical apparatus of synergetics is combined and borrowed from various fields of scientific knowledge, including group theory, nonlinear nonequilibrium thermodynamics, catastrophe theory, differential typology, nonequilibrium statistical physics, and tensor analysis. According to Professor H. Haken's concept, synergetics is a specific metascience that has an "international" character concerning other sciences, occupying a central place in scientific knowledge, studying the general nature of dependencies and patterns, which led to the discovery of interpretations and solutions to synergetic problems in various fields of science (Dzhuzha & Tychyna, 2019). However, this does not contradict the principles of objectivity in synergetics as a domain of scientific knowledge. The inherent differences between the features of the linear concept of scientific knowledge and the synergetic concept, as a response to the crisis of the 20th and 21st centuries and the flourishing of creative evolution, are presented in Table 1.

Table 1. *Comparative analysis of linear and nonlinear methods of scientific knowledge*

Subject of scientific knowledge	Scientific knowledge concepts	
	Classical linear paradigm	**Neoclassical synergetic paradigm**
Model of the world	Considered as a mechanistic structure, somewhat akin to a machine	Considered as a complex of interconnected and selforganising systems
Evolution and progress	The understanding of progress within scientific knowledge represents a linear, and also the only correct, path to development	The understanding of evolution within scientific knowledge is nonlinear and includes multiple possible developmental trajectories
Role of the environment	The external environment is defined as static and insignificant	The external environment plays an active role in the processes of change, also affecting the adaptation and development of systems
Stability and change	Stability is prioritised. Change is viewed as undesirable, while stability is preferred	Change is embraced, and its adaptive significance for the process of evolution and self-organisation of systems is recognised
Attitude to the system	The system is considered closed and independent of various external influences and micro-fluctuations	The system is considered open and dependent on external influences and internal fluctuations
Cause-and-effect relationships	Linear and their consequences are seen as directly proportional to the causes	Nonlinear, and their results are characterised as exceeding expectations or not aligning with them
Causal relationships	Development occurs linearly, progressively, and without alternatives	Development is nonlinear, includes alternatives, and adaptive changes depending on the environment
Attitude to imbalance	Imbalance is considered a negative phenomenon that must be overcome	Imbalance is viewed as the driving force behind the development of systems
Role of randomness	The concept of randomness is a secondary, marginal factor	The concept of randomness is a significant factor, which acts as a determinant for the development and selforganisation of systems
The idea of chaos	Chaos is seen as a destructive factor that must be eliminated	Chaos plays an important role in the processes of system development and is not limited to a destructive function

Source: *developed by the authors*

Linear and nonlinear methods of scientific knowledge are characterised by fundamentally different approaches to the perception of the surrounding reality. Thus, the linear paradigm of scientific knowledge is characterised by a high degree of predictability and clarity, which ensures the factor of objectivity within the framework of simple, as well as stable systems, while the nonlinear paradigm (characteristic of synergetics) provides the possibility of objective research of multidimensional, complex and dynamic systems. The objectivity of the nonlinear, synergetic paradigm of scientific knowledge is based on the use of interrelationships of emergent properties and adaptation. On the contrary, such universality of synergetics contributes to the emergence and development of a sufficient number of studies of a socio-humanitarian direction, which leads to the understanding of synergetics as a universal theory of evolution. This, as a result, is a certain basis for the emergence of mechanisms of any innovation.

It should be noted that the field of synergetics research does not have a clear definition and, most likely, cannot be limited because the interests of this science extend to all branches of scientific knowledge, natural science, the general feature of which is the study of the dynamics of any irreversible processes and the emergence of fundamental innovations (Kremen, 2014). Therefore, synergetics as a science has absorbed a significant theoretical and methodological base to reliably contribute to the development of interdisciplinary research as an objectively reliable tool of scientific knowledge and a statistically

and mathematically grounded methodological paradigm of modernity.

Understanding complexity through the synergetic framework

In philosophical and methodological sources, synergetics is a tool of scientific knowledge entirely aimed at the search for universal laws and algorithms of evolution and co-evolution of complex (nonlinear) non-equilibrium systems, which are the subject of research in the context of various ontologies. It can be said that synergetics was formed as a result of the influence of analogical thinking and comparative analysis, which represent one of the most important components of multidimensional philosophical thinking on the way to creating general scientific knowledge. Also, synergetics can be considered as a theory of the formation of new qualities. This is due to the fact that synergetics mathematically explains, using systems of nonlinear differential equations, how the branching of the old quality into new ones occurs, which is what the theory of bifurcations reflects. The bifurcation mechanism makes understandable the transition from quantitative changes to a qualitatively new choice. The strategy of the scientific search for synergetic systems can be represented as a branched graph that reproduces the alternative of development. The choice of the future trajectory of development depends on the initial conditions, the elements that are included in the system of local changes, random factors and energy influences (Kremen, 2014; Tryfonova, 2016).

Within the framework of synergetics, the internal link of the world's evolution and self-improvement is a natural flow of probabilities, which includes both deterministic, linear, and stochastic, nonlinear aspects. In this context, randomness is considered not as an unattainable necessity, but as a property of the behaviour of an open system in a non-equilibrium state. Matter, within the synergetic approach, ceases to be defined as a passive substance, which was previously described only in the mechanistic paradigm. The discovery of synergetics reveals such a quality of matter as its spontaneous activity. That is, the transformation of open non-equilibrium systems is explained not only by their reactions to changes in the environment but also by spontaneous fluctuations and innovations that naturally arise in these systems. From this arises a rethinking of the concept of "chaos", which consists in considering it as a creative principle and a constructive mechanism for the development of complex systems. In the context of synergetics, it is believed that chaos, being both destructive and constructive at the same time, contributes to the emergence of order through the process of self-organisation. I. Prigogine & I. Stengers (1984) emphasise that the source of order is the imbalance itself since it generates order from chaos. Therefore, the recognition of the effectiveness of small resonant influences on the system is a key aspect of the synergetic paradigm. According to the supporters of this paradigm, the transformation of a complex system is not limited only to the use of energy or power influences (Hrazhevska, 2006). Simple pressure directed at the system often leads to the fact that it is "reflected" in its previous structures, which are already built at certain levels of organisation (Tkachenko, 2013). Therefore, the introduction of fundamentally new structures requires an unconventional approach based on managerial influences in the field of order parameters, which may be small, but have an accurate topology and are directed at bifurcation points (Khodakivskyi *et al*., 2009).

The rejection of the impartiality of scientific knowledge and the inclusion of axiological value aspects in explanatory and predictive models becomes an important stage in the development of the scientific approach. In the context of the concept of self-organisation, the mind is considered a fundamentally new quality of self-organising systems, capable of reflecting on the stages already passed and predicting future states of the system. The involvement of a person in the self-organising universe and the recognition of the

relationship of the human world with other worlds gives global evolution a humanistic meaning. The mind, which acts as a determining factor in interaction with the environment, becomes a key factor in the evolution of the noosphere as a single "society-nature" system (Nakonechna, 2017).

The recognition of the basic limitations in predicting and controlling the behaviour of an unstable system, which manifests unpredictability both at the global level, carried out by attractors, and at the local level - by bifurcation. According to I. Prigogine & I. Stengers (1984), "events on a human scale indicate that social structures on this scale deviate from determinism... We can "explain" past events. We can consider them almost as a result of hidden determinism, but we do not have the ability to predict future events". Therefore, synergetics is a tool for understanding complex, nonlinear systems in the context of their inherent evolutionary and self-organising processes, explaining the process of emergence and development of new qualities through bifurcation mechanisms, in which the category of chaos determines the transition of processes and systems to the creation of new levels of order.

Conclusions

The use of classical methods of scientific knowledge experienced a breakdown as a result of the revolutionary discovery of quantum theory and other evidence of fundamental changes in social consciousness. Synergetics is a decisive response to changes in the world-view paradigm of scientific knowledge since the inconsistency of classical methods did not meet the scientific aspirations of contemporaries, which becomes a predictor of the emergence of neo-classical philosophy, which is reflected in the principles of the synergetic paradigm aimed at solving the main problems of the dynamic, technological, chaotic world.

Therefore, synergetics, as a new methodology, is characterised by the ability to study and determine the development of disordered, noliear, multi-variant systems within the framework of interdisciplinary approaches to various fields of scientific knowledge. The problem of the objectivity of synergetics as a scientific methodology is based on a reliable mathematical, methodological and statistical apparatus, which is characterised by a synthesis of combined and borrowed methods from various fields of scientific knowledge. Therefore, synergetics embodies a universal scientific and methodological construct of an evolutionary nature, which does not have a clear subject of research, since the synergetic paradigm is an interdisciplinary basis for the emergence and development of any irreversible processes and innovations.

In the context of modern scientific approaches, synergetics is widely used as an extremely powerful interdisciplinary construct of scientific knowledge, which ensures the analysis of complex processes within the framework of the functioning, development and interaction of complex processes. However, modern life increasingly requires the application of new approaches in scientific, technical, social, natural and other areas of scientific life, which is characterised by the need to accept the content of matter as an active substance, and also requires the inclusion of axiological and humanistic content regarding the development of a modern scientific approach in which a fundamentally new quality of systems is the category of mind and creative approach with the involvement of a person in interaction with a self-organising and self-developing environment. The prospects for further research lie in the study of the potential of chaos and the features of bifurcation as a driving force for deepening the process of creative evolution of the individual.

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Conflict of Interest

None.

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Синергетика і проблема об'єктивності в науковому пізнанні

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Анотація. Актуальність статті зумовлена значущістю об'єктивного пізнання нелінійних, хаотичних систем, які є результатом динамічної сучасної науки та викликам яких відповідає наука синергетика. Мета статті полягала у проведенні теоретичного дослідження щодо об'єктивності наукового пізнання шляхом використання синергетики як нетрадиційної наукової парадигми як у напрямку

сучасної філософії науки, так і в інших міждисциплінарних сферах. В якості використаних методів дослідження були застосовані: теоретичний, історичний, інтердисциплінарний методи, а також метод математичного моделювання. Встановлено, що синергетика представляє собою метапідхід, який виник як своєрідна відповідь людства на кризу XX-XXI століть й одночасно як результат процесів глобалізації, технічного процесу, а також певної революції усвідомлення протікання природних процесів. Визначено, що синергетика як наука та синергетичний підхід як інтердисциплінарний метод наукового пізнання дають можливість об'єктивно досліджувати нерівноважні та нелінійні трансформаційні процеси завдяки наявності теоретико-математичного апарату. Узагальнено, що об'єктивність наукового пізнання синергетики забезпечують методи нелінійної термодинаміки нерівноважних процесів, нелінійна теорія коливань у радіотехнічних системах, диференціальна типологія, теорія катастроф, тензорний аналіз, нерівноважна статистична фізика, якісна теорія диференціальних рівнянь, теорія динамічних систем. Зазначено, що методологічно-статистичний апарат синергетики як універсального методу, що доповнює кібернетику, є комбінованим та запозиченим від різних областей наукового пізнання. Досліджено, що в рамках синергетичної парадигми переосмислено розуміння «хаосу» від руйнівного початку до творчого джерела альтернативного порядку через процес самоорганізації, що народжує порядок із хаосу. Вказано, що синергетика являє собою парадигму формування нових якостей та математично пояснює особливості їх розвитку шляхом застосування нелінійних диференціальних рівнянь та теорії біфуркацій, що характеризує перехід від кількісних змін до якісно нового вибору. Практична цінність роботи полягає у висвітленні нового бачення об'єктивності наукового знання, що засноване на розумінні динаміки самоорганізації складних систем та передбачає можливість розробки комплексних підходів до вирішення сучасних проблем в рамках міждисциплінарних підходів

Ключові слова: синергетична парадигма; самоорганізація систем; відкриті нелінійні системи; флуктуація; біфуркація; творча еволюція

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The term "creativity" in the discourse of theories and concepts

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Abstract. The relevance of the research topic was determined by the need to comprehend the meaning and concept of the term "creativity" and the evolution of its development as a theoretical category. The aim was to examine the aspects of the emergence, meaning, and concept of the term "creativity" and its evolutionary development, taking into account the trends of the modern economy. One of the main methodological principles applied in the study was the principle of interdisciplinarity, which encompassed various theoretical and practical subject areas. The study also employed the method of analytical-synthetic information processing, the dialectical method, as well as the methods of system analysis and logical generalisation. The research was based on theoretical considerations of leading scholars who have studied the outlined issue. Creativity is becoming an increasingly significant factor with a substantial impact on all spheres of activity. The analysis conducted and the evolution of scientific perspectives on this category over different periods have been examined, highlighting discrepancies in its interpretation by various scholars, which account for the diversity of definitions and understandings of the term "creativity." It has been found that authors of existing theories employ different approaches to its definition and terminology, while the analysis of academic sources indicated the absence of a unified concept and understanding of the essence of creativity and stable notions in this field. When interpreting the concept of "creativity," its place within an individual's structure, the level of awareness of its various manifestations, as well as the sources and conditions of its development, are determined differently. Summarising the results of the analysis of different scholarly viewpoints, it can be stated that creativity is closely interconnected with emotional, motivational, intellectual, and activity-related spheres. However, the multidimensional nature of this concept requires further research and refinement of its definition. This article deepened the understanding of the term "creativity" in the context of theoretical discourse, which may be utilised in the teaching of academic disciplines or their components – economics, management, philosophy, sociology, political science, and others

Keywords: creative activity; evolution; post-industrial society; theoretical discourse; creative personality

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Introduction

Modern society, like the societies of previous eras, requires individuals who think unconventionally, possess creativity, and have a high level of intellectual development. Such individuals are capable of generating, creating, perceiving, and implementing various innovations across all fields of human activity. Creativity, as a theoretical category, has remained at the centre of attention for numerous scholars engaged in the development of fundamental theoretical approaches to its definition and terminology, as well as the study of the nature and essence of the phenomenon of "creativity." There are numerous theories and concepts regarding the interpretation of this term. A widely accepted definition of "creativity" is the ability to generate new and useful ideas. This definition is particularly supported by G. Dow (2022) and N. Brown *et al.* (2024). However, as interest in this topic grows and research expands, adjustments to this definition continue to emerge.

Scholars such as S. Said-Metwaly *et al.* (2021) analyse examples of creativity in various educational contexts, examining innovative international practices for fostering and developing creativity in learning while offering practical applications for diverse settings. According to H. Tiwen (2023), creativity and original thinking are essential components of academic giftedness in students. B. Rawlings & S. Cutting (2024), by integrating various studies, argue that the relationship between education and creativity is complex and requires careful interpretation. While some research highlights the positive impact of schooling on children's creative abilities, others, particularly those concerning culturally and educationally diverse populations, demonstrate how school experiences can sometimes hinder creativity. B. Hennessey *et al.* (2020) assert that early research on creativity focused exclusively on internal factors while overlooking the influence of the external environment. This led to the emergence and development of a distinct research direction – the social psychology of creativity, which explores how the social context facilitates (or hinders) the creative process.

C. Tan *et al.* (2021) note that although creativity is primarily conceptualised as the ability to produce original and adaptive outputs, originality alone is insufficient. For a result to be considered creative, it must also be useful and applicable. Empirical data confirm that novelty and utility are key components of creativity. Additionally, researchers have identified a reciprocal relationship between creativity and well-being. While previous studies demonstrated that well-being can enhance creativity, this research provides evidence that the reverse is also true: engaging in creative activities can directly improve subjective well-being, even when controlling for stress levels. This suggests that fostering creativity could be a valuable tool for enhancing overall well-being, with implications for individuals, education, and mental health initiatives.

In contemporary discourse, economic considerations increasingly dominate discussions about the formulation of creativity. K. Kasiyan (2019) argues that as a result, culture and creativity have become subordinated to materialism and profit-driven calculations, leading to a transformation in the philosophy of creativity. Reports by the World Economic Forum (The Future of Jobs Report, 2020; 2023) identify creativity as one of the most crucial skills for employees across all sectors. Scholars have long sought to develop and refine criteria for assessing an individual's potential for divergent thinking, which serves as the "core" of creativity, enabling the generation of multiple solutions to problems based on the same initial data while producing unexpected conclusions and results. Among the numerous existing theories of the post-industrial society, the concept of the creative economy has become one of the dominant frameworks. The process of globalisation has transformed creativity into a source of competitive advantage and a driving force of progress. Most experts in psychology consider creativity to be the production of something new that is both original and relevant to a specific context.

In today's world, creativity has attracted the interest of economists, as it is closely linked to the search for sources of competitive advantage. However, despite extensive experience, a vast body of academic research, and contributions from leading scholars, many aspects of this subject remain unexplored, necessitating further synthesis, development, and refinement. Since creativity lacks a clear and unambiguous conceptual framework, this results in diverse interpretations and definitions of the term, which may blur its essence. In English, no distinction exists between the terms "creatio" and "creativity", both of which are translated as "creativity". However, in modern economic history, they hold distinct meanings. Therefore, clarifying the essence of the term "creativity" becomes crucial for advancing contemporary systematic economic research. The objective of this study was to analyse the origins and evolution of the term "creativity" and to examine its theoretical foundations, essence, and content.

Materials and Methods

One of the fundamental methodological principles used in this study is the principle of interdisciplinarity, which encompasses various theoretical and practical subject areas. Interdisciplinarity serves as a key methodological foundation in numerous contemporary studies, particularly when the research subject is multifaceted and requires epistemological and methodological expansion beyond a single discipline. The study also employed the following methods: the analytical-synthetic method for examining and systematising different scientific theories and concepts; the dialectical method and system analysis for investigating existing theories, studying the system of concepts and propositions; the method of logical generalisation for formulating conclusions and recommendations. Overall, the research was grounded in the theoretical considerations of leading scholars who have explored the given issue.

At the initial stage of the study, an analysis of the primary theories and concepts defining the term "creativity" was conducted. Various sources of information were utilised, including official reports, academic publications, and books. Next, the relevance of the selected topic was examined. Subsequently, an appropriate list of literary sources was compiled, followed by an analysis and comparison of different scientific theories and concepts. The study also explored the evolutionary changes in the perspectives of leading researchers who have examined this issue. To deepen the analysis and systematise theoretical material related to the concept of "creativity," the content analysis method of academic publications was applied. This approach enabled the identification and classification of key categories, concepts, and definitions of creativity as presented in the studied literature. Particular attention was given to identifying commonalities and differences in how various scholars interpret creativity, as well as to tracing the evolution of these interpretations over time. The findings from the content analysis were utilised for synthesising and structuring the collected information, ultimately contributing to a comprehensive understanding of creativity as a theoretical category. Finally, using the method of logical generalisation, conclusions were formulated, and prospects for further research were outlined. The informational basis of the study comprised diverse perspectives and interpretations from numerous scholars regarding the essence of "creativity," with a total of 54 sources referenced.

Results and Discussion

Key historical aspects of the emergence of the term "creativity"

Archaeological excavations in Africa have revealed that the evolution from a sharpened stick to a spear took approximately 1-1.5 million years. Every familiar object is the result of numerous inventions. Creativity is a necessity for survival, as humans have always sought new solutions to various problems. For centuries, the phenomenon of creativity has intrigued psychologists, educators, philosophers, geneticists, writers, poets, actors, and artists. During antiquity, creativity was

regarded as a unique form of existence. According to Plato, "wisdom belongs to the gods, and humans can only be lovers of wisdom – philosophers," implying that every individual possesses a certain degree of creative potential (Prokopenko, 2018). Plato identified contemplation and imitation as the main sources of creativity. Aristotle, in turn, examined the aesthetic concept of mimesis – the imitation or representation of reality – emphasising not mere copying but rather imaginative reproduction. While Plato believed that inspiration and creative ideas were granted by divine blessing, making humans conduits of the gods, Aristotle argued that inspiration arises from intellectual associations.

In the Middle Ages, the phenomenon of creatio as creativity was perceived as an act of divine will, creating existence from non-existence. Augustine of Hippo asserted that "a created being cannot create" (Williams, 1985). The phrase "creatio ex nihilo" – was used to describe divine creation, meaning that the term "creatio" was already in use. M. Runco and R. Albert (2010) note that during the Renaissance, the focus of knowledge shifted from affirming the divine presence to studying human-made creations. The importance of human creativity became the foundation for the modern meaning of the lexeme create. The Renaissance revived interest in art, literature, philosophy, and science. During the Reformation, creativity extended beyond the arts to science, technology, politics, and economic activities. Philosophers began interpreting creativity as an insightful yet accidental combination of existing elements, closely resembling invention. The Romantics, in contrast, rejected conventional rules in favour of imagination and originality, valuing uniqueness over abstraction and rigidity.

As society evolved, scientific discourse enriched itself with new concepts, expanding existing terminology. The proliferation of linguistic and terminological borrowings in contemporary academic works reflects the evolution of knowledge. The term "creativity" emerged from this intellectual expansion, representing a wide range of phenomena inherent to human existence. In its broadest sense, creativity denotes the act of creation. For centuries, scholars have explored the nature, origins, and patterns of the creative process. Plato considered inspiration to be divine, whereas Aristotle saw it as the result of human intellectual associations.

In 1393, G. Chaucer used the word "create", yet the conceptualisation of creativity remained weak (Runco & Albert, 2010). The lexeme "creation", combining the act of creation with human activity, acquired its modern meaning only in the 18th century. The first significant study of the creative process took place in 1767, when W. Duff (1767) stated that creative genius arises from an innate ability to engage in associative imagination, facilitating the combination and evaluation of ideas and aesthetic qualities. The founder of differential psychology and psychometrics, F. Galton (1869), argued that mental abilities, like physical traits, are hereditary. His work is considered the first major contribution to creativity research, marking the beginning of empirical studies on creativity (Runco, 2004).

H. Bergson distinguished creativity from invention, emphasising the intuitive nature of creative emergence, which originates from the individuality of a unique, holistic, and indivisible creator (Sivers & Buhaiova, 2023). H. Bergson viewed evolution not as a mechanical adaptation to the environment but as a purposeful and creative process. He believed that novelty arises from "creative wings". Meanwhile, the English psychologist C. Spearman (1904) described creativity as a cognitive force that generates new meaning by modifying existing ideas and forming new connections.

Theoretical approaches to defining the term "creativity"

The term "creativity" was first used by R. Simpson (1922) to describe an individual's ability to abandon stereotypical thinking (Pavlenko, 2016). However, creativity was fully recognised as an independent concept only in the 1950s

following the publications of J. Guilford (1950), who distinguished between two types of cognitive operations – convergent and divergent thinking (Tkach, 1999). In particular, J. Guilford (1967) highlighted divergent thinking processes as the foundation of creativity. He argued that creativity is an innate human potential and is genetically determined. He also identified key criteria for creativity, along with hypothetical intellectual abilities that define its level (Table 1).

Table 1. *Key criteria for creativity and intellectual abilities that characterise it*

Criteria	➤ ability to identify and formulate problems ➤ ability to generate a large number of ideas ➤ originality – the ability to produce distant associations, non-standard responses, and unconventional solutions ➤ semantic flexibility – the ability to identify the key characteristic of an object and suggest new ways to use it ➤ adaptive flexibility – the ability to change forms to discover new features and applications ➤ spontaneous semantic flexibility – the ability to generate various ideas in an unusual situation
Intellectual abilities	➤ speed of thought – the number of different ideas generated per unit of time ➤ cognitive flexibility – the ability to quickly switch between ideas ➤ originality – the ability to generate ideas that differ from common perceptions ➤ curiosity – sensitivity to global problems ➤ hypothesis development ability ➤ irreality – logical independence of a response from a stimulus ➤ fantasy – proposing ideas completely unrelated to reality while maintaining logical connections between stimuli and responses ➤ problem-solving ability – the capacity for systemic analysis and synthesis ➤ ability to refine anything by adding new details

Source: *Compiled by the author based on data from J. Guilford (1967)*

One of the most well-known founders of creativity theory is the American psychologist E. Torrance, who began studying creativity in 1958 and dedicated his life to this field. He defined creativity as a process, which involves: recognising problems, gaps in knowledge, discrepancies, and disharmony; identifying these problems; searching for solutions, generating hypotheses; testing, modifying, and re-evaluating hypotheses; forming conclusions (Torrance, 1977). Torrance identified four parameters of creativity: fluency, flexibility, originality, and accuracy. According to his "Threshold Theory of Intelligence", intelligence and creativity form a single factor. This means that low-intelligence individuals cannot be creative, but highly intelligent individuals may still have low creativity. E. Torrance (1977) defined creativity metaphorically: "It means digging deeper, seeing better, fixing mistakes, talking to a cat, diving into the depths, passing through walls, lighting up the sun, building a sandcastle, and greeting the future." His conclusions were based on J. Guilford's theory of divergent thinking. However, critics argue that Torrance's definition does not distinguish creativity from other types of thinking, making it overly broad.

A. Whitehead (1932) introduced the term "creative ability" while using "creativity" as a universal principle. In his book, he suggested that so-called new ideas are merely combinations of existing ones. He linked creativity to the actualisation of potentiality, arguing that it is a processual phenomenon inherent in all entities: "The process of creativity is a form of unity in the universe." A. Maslow (1943) defined creativity in terms of freedom, spontaneity, and self-acceptance, which allow individuals to fully realise their potential. He viewed creativity as a universal trait, which most people lose under external influences. While intellectual giftedness is a necessary condition for creativity, it is not sufficient on its own. Personal traits, motivation, and

values are critical in determining creative behaviour. According to Maslow, key characteristics of a creative personality include cognitive abilities and independent thinking.

M. Stein (1953) described creativity as a process of creating something new and valuable, which is accepted by society. He emphasised that creativity does not exist in isolation – it is shaped by social and cultural contexts. Novelty and usefulness are fundamental criteria for assessing creativity, but they depend on cultural influences. Stein also argued that creative individuals both influence and are influenced by culture. The Ukrainian scholar V. Moliako (1989) defined creativity as the ability to reflect a person's deep capacity to make unconventional decisions and create original values. He identified the following characteristics of creativity: originality, heuristic thinking, activity, focus, imagination, clarity, sensitivity. V. Moliako also highlighted that creative individuals are driven by a desire for originality, a tendency to challenge norms, a high level of knowledge, the ability to analyse and compare phenomena, quick learning skills, and systematic, independent work.

According to J. Kao (1996), creativity is: "A holistic process of generating ideas, developing them, and transforming them into value. This process integrates what people call innovation." He noted the synchrony between the art of creating new ideas and the science of bringing them to life. Thus, different researchers take varying approaches to defining creativity. Some believe the term "creative" applies only to rare, specialised abilities. Others argue that creativity is a universal human trait found to some extent in all healthy individuals. Some scholars suggest that every person is a creator. D. Leap (2012) referenced notable thinkers who viewed creativity as intrinsic to human nature – J. Cameron: "Creativity is the natural order of life." P. Johnson: "I believe that creativity is inherent in all of us." Photographer J. Lurie: "Creativity is our birthright. It is as fundamental to being human as walking, talking, and thinking." Thus, creativity remains a multifaceted concept, with definitions ranging from a rare gift to an essential human characteristic.

Comparative analysis of creatio and creativity

The originality and creative freedom of an artist are considered the highest values of individuality. A genius does not follow established rules but creates them. However, while intellectual activity can generate new combinations of existing elements, it cannot produce something fundamentally new. It is important, therefore, not to confuse creativity with creatio. Creatio is an activity aimed at producing various spiritual and material values. Historically, the term "creative abilities" was used, but over time, it was replaced by the English loanword "creativity, creative". Initially, "creation" was associated solely with artistic expression. However, as the term expanded, creativity and art were differentiated – they were no longer seen as mutually inclusive. In the early 20th century, Polish philosopher J. Łukasiewicz and French philosopher H. Bergson explored creativity in science and nature. However, they largely focused on artistic characteristics rather than scientific or natural processes (New World Encyclopedia, n.d.).

Many scholars, including J. Guilford (1975), C. Taylor (1988), J. Kaufman & J. Baer (2012), and others, considered it necessary to distinguish between the categories of creatio and creativity based on the outcome of the activity. Creatio is a process of creative activity aimed at generating an entirely new product or finding an unconventional solution to a problem. However, it does not necessarily imply the existence of a final result (Simonton, 2018). Thus, creatio can be defined as an activity pursued for the sake of the process itself. Creativity, on the other hand, is a process inherently directed towards an outcome. The result of a given activity is a necessary and crucial component of this process. Therefore, creativity is work focused on achieving a result, with the essential goal of producing a specific final product. The word "creativity" is defined in The Great Explanatory Dictionary of Modern Ukrainian (Busel, 2005) as innovative, creative activity, referencing the definition of "creating". This confirms the idea that the term

was borrowed, as it originally meant "creatio" in Ukrainian. Consequently, the term "creativity" and its modern interpretation must be understood in the context of English-language definitions. However, according to G. Pennycook (2018), the word originates etymologically from the Latin "creare, creatio", which translates as "to create".

When studying the etymology of the word "creativity," many literary sources reference the statements of ancient Greek philosophers, and the evolution of its understanding can be traced from divine creation to human creation. It is a multidimensional concept based on human experience. This is emphasised by Yu. Bazhal *et al*. (2015) who focus on innovative entrepreneurship. L. Fedulova (2017) notes that, while being typologically similar to creatio, creativity has certain specific differences on theoretical-methodological, functional, and practical levels. Depending on the area of application, the term acquires different semantic meanings. Therefore, this concept is not well-established in scientific terminology, and there is no single universally accepted definition of creativity. Scholars researching this issue offer their interpretations of the term, from which a general understanding can be formed. Most Ukrainian scholars define creativity as the realisation of a creative idea in traditional areas of life through non-traditional methods and in an unconventional form. In the New World Encyclopedia (n.d.), creativity is defined as a process that involves generating new ideas, new associations between them, and converting them into a product that is novel and original.

The increasing number of studies on this issue indicates that creativity is specific to each field, and its generalised skills or traits do not always reflect such specificity. The term "creativity" unites many artefacts, processes, and people, while the term "creatio" can unite a variety of unrelated cognitive processes across different fields. However, such concepts may be misleading due to a lack of cognitive psychological validity. This influences the understanding and assessment of creativity and, consequently, requires a review of the results of general creativity tests, which may have led researchers to unacceptable interpretations. J. Baer (2012), in his work, notes that the theory of creativity should consider simpler goals for theory development and should necessarily pay attention to methods of metatheoretical heuristics.

Modern theories and concepts of creativity

An analysis of recent studies on this phenomenon leads to the assumption that there is no definitive answer to the question: what exactly does the term "creativity" mean? Is it a scientific construct? Is the process of creativity independent, or is creativity a sum of other mental processes? In this context, S. Mednick (1962) emphasises that the essence of creativity is the ability to discard stereotypes during mental synthesis and within the associative field. He replaces J. Guilford's concept of divergence with the actualisation of a distant zone of the semantic environment: "The more distant the elements taken from the problem's segments, the more creative the process of solving it becomes." The creative process is seen as the reformatting of associative components into new combinations. The decision made differs from stereotypical ones, and the criterion of creativity in decision-making is the degree of deviation from the existing stereotype. Additionally, the cognitive theory of "innate structures" by J. Fodor (1983) argues that nothing can be created from nothing; rather, a particular problem-solving process is described through the interaction of various other processes, such as thinking, memory, etc.

Thus, studies indicate that creativity does not inherit individual traits. It is argued that external factors play a decisive role in shaping creative abilities, influencing them both positively and negatively. F. Barron & D. Harrington (1981), summarising research on creativity in the 1980s, made the following generalisations about existing knowledge:

- creativity is the ability to adaptively respond to the needs of new approaches, allowing one to recognise novelty, whether the process is conscious or unconscious; it is the ability to

generate non-standard ideas, deviate from traditional thinking, and quickly find solutions to problems;

- the features of the creative process and product are originality, adequacy, validity, and suitability at the moment;
- the creation of a new creative product is highly dependent on the individual creator and their intrinsic motivation;
- creative products exhibit great diversity in their characteristics: new solutions to problems in any sphere of activity, the discovery of physical, chemical, or biological processes, creation of music, paintings, or literary works, new philosophical or religious systems, innovations in law, economics, technology, and unconventional solutions to social issues.

One of the latest modern concepts of creativity is R. Sternberg's "Investment Theory" (1994). He referred to creative individuals as those who can "buy ideas cheaply and sell them dearly." "Buying cheaply" refers to being interested in unknown, unrecognised, or unpopular ideas at the moment. A creative person is able to correctly evaluate their potential, possible demand, and develop these ideas, selling them for a high price. Once success is achieved with one idea, the person moves on to the next. Another issue concerns the source of such ideas. R. Sternberg (1994) viewed a talented person not as one who generates new ideas but as one who can establish meaningful connections, understand the idea itself and its functions in relation to other elements of the existing knowledge space. Creativity thus implies the ability of a person to wisely take risks, fight obstacles, resist the opinions of others, and possess internal motivation and tolerance for uncertainty. According to the "Investment Theory," the development of an individual's creativity is facilitated by certain interconnected components, such as:

- abilities, particularly synthetic (the ability to see problems from a different perspective, divergent thinking), analytical (the ability to analyse and evaluate new ideas), and practical-contextual (the ability to determine the practical application of abstract ideas);
- thinking;
- personal qualities, the most important of which are the ability to remove obstacles and uncertainty and to take justified risks;
- knowledge, which helps creatively apply theory in practice;
- motivation, which promotes focus on the creative process;
- the surrounding environment, which supports the possibility of discovering and developing creativity.

H. Eysenck (1998) noted that creativity is a component of general intellectual giftedness. In turn, S. Swap (1993) did not consider creativity a talent but viewed it as a purposeful process of developing and expressing entirely new ideas, for which a specific approach is needed that maximises individual giftedness, experience, and qualifications. O. Voitenko (1997) argued that creativity can manifest in various types of activities by the same person. For example, if a scientist does not find their place in science, they may be a talented organiser and educator, or both simultaneously. Creativity is seen as a set of various skills and abilities, which can be expressed to varying degrees in a particular individual. The definition of "creativity" is based on the concept of reevaluation, the essence of which is a change in perspective, attempting to view a situation from another point of view. L. Vygotsky wrote: "It would be a miracle if imagination could create something from nothing or if it had other sources for its creations besides previous experience" (Maksymenko, 2017). Everything new that appears in a person's imagination is formed from elements of the surrounding reality contained in the previous experience they have acquired. Ya. Ponomarev, in considering the essence of creativity as a psychological property, noted that it is intellectual activity and sensitivity to the side effects of one's own actions (Antonova 2012). In other words, a creative person will see by-products, which are the creation of something new, while others may

only see the results of achieving the original goal, without recognising the novelty.

Meanwhile, O. Kulchytska (2002), I. Hrynenko (2008), and others define the essence of creativity as: the ability to generate unusual ideas, depart from standard patterns, and quickly and easily find unconventional solutions to problems; an ability that reflects the personality's property to create new, original values, make non-standard decisions, and avoid stereotypes; the ability to create a new product in any form. Researchers T. Lubart *et al.* (2010) note that the term "creativity" reflects the idea of experimenting with new results. In other words, "creativity is the ability to generate new ideas within a theme. These results must be new in the sense that they should go beyond merely copying what already exists."

K. Szmidt (2010) viewed the concept of creativity as closely related to the concept of creativity. He considered it the ability of people to generate new, primarily valuable products – working methods, goods, ideas, etc. According to the scholar's definition, creativity is a characteristic of an activity that results in the emergence of a new product. If defined as a characteristic of a person, it refers to inventiveness, producing a variety of ideas, or the ability to come up with many solutions to problems; generating valuable, fundamentally new ideas and concepts. The researcher noted that the term "creativity" refers not to the product of the creative process but only to the person. The researcher identified certain characteristics that form a creative individual: openness and tolerance for ambiguity; a unique vision and perception of the world; no fear of the unknown; independence and courage; spontaneity and expressiveness; a good sense of humour; the ability to focus and be passionate about the task; the ability to integrate opposites.

Creativity within the economic discourse

The current Generation Z not only actively consumes but also produces creativity, monetising it through Instagram and Snapchat. Indeed, 51% of millennials claim that they are more creative than previous generations. At the same time, the understanding of creativity is focused on the result-oriented activity, which may require not only creative but also routine and tedious work. However, creativity does not divide activity into result-driven or resultless. In today's post-industrial society, there is an active search for sources to form competitive advantages, with creativity gaining increasing significance. This is why numerous debates among scholars continue about the understanding of the term "creativity" as a theoretical category. Contemporary views on creativity are gaining more importance specifically within the economic discourse. In this sense, a creative person is inventive, quick-witted, and pragmatic, while a creative person is a contemplative individual whose activities are primarily based on inspiration, abilities, and so on.

The most popular scientific concept of creativity in literary sources is its manifestation in the creation or implementation of anything new, a particular creative product, a unique combination, that is, something with applied value. The most appropriate formulation in the field of economics is the creation of a new, unique product that can be commercialised with its inherent practical value. Creativity itself does not necessarily carry practical use or convert into a certain product, while creativity, in its modern interpretation, involves creating a directly valuable product or new solution and, importantly, generating added value. This understanding of the term is prevalent in the creative economy and is of particular interest to contemporary researchers in theory and concepts.

The modern content of creativity is determined by the demands of the current stage of civilisational development on human activity. I. Kakko & S. Inkinen (2009) state that the activation of abilities, talents, and knowledge of an individual results in the creation of a creative product with innovative content. Society increasingly understands that creativity directly or indirectly influences the economy, improving performance indicators, stimulating innovations, and contributing to its social and sustainable development.

It is creativity that becomes the foundation for creating economic value. The concept of "creativity" is more often used in economics, distinguishing it from artistic creativity. Therefore, the terminology in this field requires improvement and specification.

Summarising the results of the analysis of the concept of creativity, it is important to note that creativity is currently an interdisciplinary concept, widely represented in philosophy, sociology, political science, psychology, linguistics, pedagogy, economics, etc. In modern science, there is a tendency to analyse creativity within specific fields of study. Therefore, this disrupts the holistic view in terminology. The author of this article agrees with existing concepts that the term "creativity" reflects the general characteristic of an individual, influencing creative productivity in any sphere of activity. The author also believes it necessary, in the current conditions, to emphasise that creativity is aimed at creating a new, unique product with inherent practical value for its subsequent commercialisation. Summarising the results of analysing various scholars' views, it is important to note that creativity has an integrative nature and is closely related to the intellectual, emotional, motivational, and activity-based spheres of personality.

Conclusions

The emergence of the term "creativity", its separation from the term "creatio", and its widespread use as an independent theoretical category are associated with the rapid dynamism, complexity, and unpredictability of events in the modern social and economic environment. Despite the active interest of scholars in this topic, there is no consensus on the clear definition of concepts. The analysis of scientific sources on this issue shows the absence of a unified concept and understanding of the essence of creativity and stable terms in this field. Some authors emphasise that the term "creativity" can only be applied to specific types of abilities that are rarely encountered, while others believe that the term refers to a general creative ability that all healthy individuals possess to some extent.

Creativity is also often represented as the opposite of everyday life, which implies an unconventional approach. Different approaches are used to interpret the term "creativity": its place in the structure of personality, the levels of awareness of its manifestations, the sources and conditions for its development are defined in various ways. The term "creativity," which reflects the general characteristic of an individual influencing creative productivity in modern conditions, necessarily requires emphasis on its focus on creating a completely unique product with inherent practical value for its subsequent commercialisation. Creativity has an integrative nature, closely connected with various spheres of personality, and, in today's context, acquires particular importance in the development of the economy. However, the presence of different perspectives and reflections on the essence of the concept of "creativity," both in the past and in the present, requires further research, which will focus on analysing the formation and development of the creative sector of the economy.

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Conflict of Interest

None.

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Термін «креативність» у дискурсі теорій і концепцій

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Анотація. Актуальність теми дослідження визначається необхідністю осмислення значення та поняття терміну «креативність» і еволюції його розвитку як теоретичної категорії. Мета – дослідити аспекти виникнення, значення та поняття терміну «креативність» і еволюції його розвитку з урахуванням тенденцій сучасної економіки. Одним з основних методологічних принципів, використаних у дослідженні, був принцип міждисциплінарності, який містить різноманітні теоретичні та практичні предметні сфери. Також використані: метод аналітико-синтетичної обробки інформації і діалектичний методи, метод системного аналізу і логічного узагальнення. Дослідження базувалося на теоретичних міркуваннях провідних науковців, які займалися розробленням окресленої проблематики. Креативність стає все більш значущим фактором із суттєвим впливом на всі сфери діяльності. Проведено аналіз і розглянуто еволюцію формування наукових поглядів у різні періоди на розуміння цієї категорії, розкрито розбіжності у трактуванні її різними науковцями, які зумовлюють різноманітність тлумачення та визначення поняття терміну «креативність». Виявлено, що автори існуючих теорій використовують різні підходи до визначення й термінології, а аналіз наукових джерел свідчив про відсутність єдиної концепції і розуміння сутності креативності та стійких понять у цій сфері. При трактуванні поняття «креативність» місце її у структурі особистості, в рівні усвідомлення її різноманітних проявів, джерела та умови розвитку визначають по-різному. Підсумовуючи результати аналізу різних точок зору науковців, можна зазначити, що креативність має тісний взаємозв`язок з емоційною, мотиваційною, інтелектуальною та діяльнісною сферами. Однак багатогранність цього поняття потребує подальших досліджень і вдосконалення його визначення. У статті поглиблене розуміння терміну «креативність» у контексті теоретичного дискурсу, що може бути використане при викладанні навчальних дисциплін або їх складових – економіки, менеджменту, філософії, соціології, політології тощо

Ключові слова: творча діяльність; еволюція; постіндустріальне суспільство; теоретичний дискурс; креативна особистість

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Phenomena of colonialism and postcolonialism in the context of modern Ukrainian realities

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Abstract. When Ukrainian researchers assert that Russia's policy towards Ukraine was colonial, this claim is often questioned by Western scholars. Russian-Ukrainian relations do not neatly fit into such a model. Therefore, the key question of this study was: to what extent is it justified to define Russian Ukrainian relations as colonial, given that Ukraine's current and future development largely depends on the decolonisation of Ukrainian consciousness? This study aimed to define the concept of "colonialism", substantiate the thesis given that Ukraine was colonised by Russia, and develope decolonisation practices. To achieve this, the study employed empirical methods alongside theoretical research methods, including analytical, synthetic, phenomenological, and philosophical reflection. Furthermore, interdisciplinary research methods such as case study, commemorative, philosophical, and historical analysis were utilised. At present, Ukraine is experiencing a postcolonial condition, which results from its historical statelessness, dependence on Russia, and a systemic policy of denationalisation imposed by the metropole. This policy has included the enforcement of an inferiority complex, the suppression of claims to Ukraine's language, culture, and elite, the erosion of national dignity, and assimilation into the dominant imperial identity. While empires collapse under the pressure of objective factors, Russia, as an imperial centre, actively resists these processes – primarily through open military aggression, sabotage, and information warfare, including psychological manipulations. The postcolonial condition of Ukrainian society manifests in a fragmented national self-identification, an unstable value system, disrupted cultural codes, and deep seated psychological crises at the archetypal level of consciousness. This is further reflected in linguistic disputes, religious conflicts, and other socio-cultural tensions. The practical significance of this study lies in its conclusion that overcoming the negative postcolonial consequences is essential for achieving freedom, advancing

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European integration, strengthening national identity, and promoting humanistic values. The study aimed to liberate Ukrainian consciousness from post imperial manipulative practices

Keywords: postcolonial practices; ethnocide; linguicide; manipulation of history; sociocultural transformations; historical trauma; national identity

Introduction

The topic of decolonisation has gained prominence in modern academic discourse. This development has been driven by globalisation processes, which have blurred the boundaries between colonies and metropoles while expanding decolonial political geography against the backdrop of transnational convergence. Given this, the methodology of postcolonial research is evolving: "Calls for decolonising theory, knowledge, methods, and the university have gained traction in academia" (Kamal & Courtheyn, 2024). The colonial practices of the past were based on explicit racial, geographical, cultural, and economic divisions and were later reinterpreted by the collapse of empires and the decline of the Western-centric model of the world. These postcolonial studies examine fundamental shifts in Western military doctrine, the diversification of cultural and economic relations between former colonisers and the colonised, the transformation of memory politics, the dismantling of white and Eurocentric canons, the promotion of linguistic pluralism, and the universalisation of knowledge. Within postmodern academic discourse, it has been proposed that transcending identity politics – through the fusion of cultures, identities, and styles – constitutes a step towards liberation from classical metanarratives and the establishment of a just international order in the context of globalisation and advancements in communication technologies. Accordingly, researchers C. Yan & M. Benhima (2024) emphasise the importance of legal pluralism, which involves the integration of customary law into formal legislative frameworks. According to the authors, this approach contributes to "pluralism's importance in fostering inclusive governance, resolving historical grievances, promoting social cohesion, and embracing diversity…, and the enhancement of local governance structures and community involvement".

In the current study, typical postcolonial interpretations were applied to Russian-Ukrainian relations through the ontologisation and critical reflection of postcolonial issues. The main argument of the study was that, although Russian-Ukrainian relations do not fully conform to the conventional "metropole-colony" model, they nevertheless exhibit its characteristics. In G. Ciglia-no's (2024) study, conducted in the context of the 2014 Russian invasion of Ukraine and aimed at periodising Russia's return to great-power politics through an analysis of its geopolitical strategies, Russian policy towards Ukraine is characterised as imperial. However, from the perspective of the authors of this article, Russia has never abandoned its pro-imperial narratives. Thus, attempts to periodise its policies fail to reflect the actual situation. This issue constituted the core focus of the current study, as Russian great-power politics ultimately resulted in the colonisation of Ukraine.

The Ukrainian struggle for liberation from colonial dependence culminated in the outbreak of a full-scale war. Expanding on this idea, M Olcese *et al*. (2024) examined Ukrainian refugee communities in Italy. The authors concluded that a collective identity had formed among Ukrainian refugees, serving as a unifying factor in overcoming the traumas and hardships of war. They identify key indicators of identity resilience as faith, spirituality, information communication, leadership ability, and social support. The phenomenon of a resilient Ukrainian collective identity, shaped by complex and socially significant unifying factors, can be defined as "national identity". In

general, in modern Ukrainian studies, particularly in the context of the Russian-Ukrainian war, the issue of national identity as both a phenomenon of collective belonging and a foundation of national and international security has become a focal point of academic inquiry (Mudrakov *et al.*, 2023). In particular, P. Horinov & R. Drapushko (2022) assert that "an inclusive sense of national identity remains critically important for supporting a successful modern political order" as this presupposes citizens' political consciousness and a social consensus on addressing the nation's past, present, and future within the framework of Ukraine's European aspirations. Researchers O. Marukhovska-Kartunova *et al.* (2025) draw attention to a socio-cultural dichotomy in Ukraine, resulting from the significant influence of Russian culture on national self-identification. They identify war as a catalyst for Ukraine's decolonisation processes and socio-cultural transformation: "These changes are fostering a more robust national identity, enhancing the societal aspect of this identity, and catalysing a shift from feelings of inferiority to a rise in national pride and patriotism".

This analysis underscored the relevance of interpreting Russian-Ukrainian relations through the lens of colonialism. Thus, the purpose of this study was to conduct a comparative analysis of colonialism to substantiate the claim that Ukraine was colonised by Russia and to develop decolonisation practices aimed at liberating Ukrainian consciousness and consolidating the nation around shared national identity values.

Literature Review

Modern dictionaries define postcolonialism as follows: "A line of thinking in philosophy, theology, political science, history, and literature since the second half of the 20th century that seeks to understand the consequences of colonial rule. As an ideological movement, postcolonialism is concerned with identity, culture, and literature in the sense of cultural conflict between former or current colonies and colonising countries" (Moore, 2001). Historical perspectives on colonisation processes have undergone significant revision, incorporating the discourse of multiculturalism, the rise of social movements, and the growing emphasis on reconciliation. At the same time, it should be noted that the discourse of decolonisation primarily centres on the opposition between the Global North and the Global South, which is understandable in the context of the collapse of major Western empires. The descendants of colonisers have assumed responsibility for the actions of their predecessors, leading to a sense of guilt and remorse that has prompted efforts to compensate for the negative consequences experienced by (post)colonised peoples (Bruckner, 2012).

E. Thompson (2006) articulated this position at the turn of the 20th and 21st centuries: "It is tough for a modern Ukrainian to imagine himself outside the Russian context... This results from a long-term, generation-by-generation, imperial cultural policy". However, the author's insights did not gain traction in the early 2000s. It took a quarter of a century and a major war to recognise Ukraine's colonial condition, critically reassess three hundred years of history, and develop decolonial practices.

Awareness of the colonial nature of the spread of communist ideology and governance in the Russian Empire/USSR is evident in several scholarly research. In particular, V. Velickovic (2012), in examining the wartime experience of the former Yugoslavia, notes the connection between the communist regime and colonial practices in Eastern Europe and considers solutions for overcoming them. Yugoslavia is also depicted as an artificial pro-imperial entity that disintegrated through the liberation struggles of its constituent parts. In analysing postcolonial practices, Polish researcher H. Cervinkova (2012) compares them with the concept of postsocialism, which was proposed to Eastern European countries as a framework for overcoming the consequences of the socialist past. However, the concept is of questionable value, representing an unjustified expansion of the categorical framework with additional notions that lack epistemological utility

in understanding colonialism within the Eastern European model. This hegemonic epistemology of postsocialism distinguishes it significantly from postcolonialism and raises questions about its usefulness as an intellectually empowering tool for scholars in addressing local inequities arising from the effects of global capitalism.

A similar notion, termed "socialist postcolonialism", is explored by another Polish researcher, A. Sosnowska (2019), who examines it in the context of the "reconsolidation" of memory. The key argument is that the ideology of socialist bloc countries aimed to construct a collective memory among the population centred on the values of "fraternal peoples", "ideological kinship", and other constructs intended to unite communities based on ideological markers and artificial notions of class solidarity. The dissolution of the socialist bloc halted such attempts and allowed for the formation of collective memory based on markers of national and ethnic commonality, rather than class or ideological affiliation. The fate of the nations that were part of the USSR, especially the so-called Union Republics, was even more tragic. For example, B. Krzysztan (2022) uses the terms "region of memory" and "interpretation of the neo-imperial ladder" in analysing Russian policy towards subjugated peoples. He introduces concepts such as "region of memory", "repository of the stairs", "interpretation of neo-imperial narratives", "multi-level mnemonic appeals", and "discourse of 'liberation'", which describe attitudes towards the Soviet and imperial past, as well as the significance of their study. The author's perspective is shaped by his own first-hand experience of colonial Russian policy and the occupation of Georgia. B. Krzysztan (2022) states: "Not only has the abuse and misuse of history been deeply ingrained in Russian politics but, to a significant extent, these might become the basis for the acceptance of imperial genocidal aggression…, despite the extensive research on memory and its use in Russia, the dangers and consequences of a distorted politics of memory at the state level must be still exposed by researchers. There is no room for the search for neutral narratives". Therefore, as evidenced by the diverse scholarly perspectives presented, understanding the colonial dimensions of Russian/Soviet influence in Eastern Europe requires critical engagement with postcolonial theory and a rejection of misleading or inadequate concepts such as postsocialism.

Materials and Methods

This study employed a multifaceted methodological approach, drawing upon a combination of philosophical and scientific methods to investigate the complex nature of Russian-Ukrainian relations and their potential classification as colonial. A dialectical approach provided a framework for understanding the dynamic interplay of historical processes and the evolving nature of the relationship between the two nations. This approach allowed for the examination of contradictions and transformations over time, recognising that historical narratives are not static but subject to continuous reinterpretation and re-evaluation. Analytical methods were utilised to deconstruct the intricate phenomena of social life that have emerged from this relationship, including denationalisation, marginalisation, assimilation, ethnocide, and linguocide. These methods facilitated the identification of causal relationships and the unravelling of complex social dynamics. To ensure a comprehensive understanding, a contextual approach was employed to situate these phenomena within their specific historical and cultural contexts. This contextualisation involved examining the political, economic, social, and cultural factors that have shaped the relationship between Russia and Ukraine over time. Furthermore, the study adopted a commemorative approach, focusing on the social memory of the Ukrainian nation and the identification of potential gaps or distortions within this collective memory. This was crucial for understanding how historical narratives are constructed, maintained, and potentially manipulated.

The research design incorporated both empirical and theoretical methodologies. Empirical

methods were employed to gather factual evidence supporting the thesis of Ukrainian colonisation by Russia. This involved examining historical documents, archival materials, statistical data, and other relevant sources to establish a factual basis for the arguments presented. Theoretical research methods, including analytical, synthetic, and philosophical reflection, were used to interpret and synthesise the collected empirical data. These methods enabled a deeper understanding of the core issues at stake and facilitated the construction of a coherent theoretical framework. A phenomenological approach was adopted to identify and describe the essential characteristics of the phenomena under investigation, focusing on the lived experiences and perceptions of those affected by the historical processes under scrutiny. This approach allowed for a nuanced understanding of the subjective dimensions of colonisation and its lasting impact on Ukrainian society.

Moreover, the study adopted an interdisciplinary approach, drawing upon insights from various fields, including history, philosophy, sociology, political science, and cultural studies. Specific interdisciplinary methods employed included case study analysis, focusing on specific historical events and periods to illustrate broader trends; commemorative studies, examining how historical events are remembered and commemorated; and philosophical-historical analysis, providing a deeper understanding of the ideological and historical underpinnings of the relationship between Russia and Ukraine. This interdisciplinary approach aimed to provide a holistic and comprehensive understanding of the complex historical and contemporary dynamics at play, leading to more robust and nuanced conclusions. This comprehensive methodology ensured a thorough investigation of the research question.

Results and Discussion

Ontologisation and reflection on postcolonial issues in Ukraine

The centuries-old relations between Ukraine and Russia have been interpreted in a colonial context, with Russia portrayed as a country with deeply rooted imperial traditions. From a historical perspective, the Russian Empire took shape during the reign of Peter the Great (17th – early 18th centuries). An atypical feature of this empire, which distinguished it from others, was the colonisation of neighbouring lands, including Ukraine, which was far more developed than the imperial centre. Peter the Great set the task of "cutting a window to Europe" for a country with a poorly educated and uncultured population. This so-called "window" was opened by inviting Ukrainian educators, clergy, and university professors to Muscovy. There was no equal cooperation; the imperial government used various means, ranging from bribery to direct violence, and restructured the army to ensure its dominance and the central government's monopoly on power. What began as cooperation and mentoring turned into colonial enslavement, accompanied by the appropriation of historical narratives and a reassessment of values. The Cossack Hetman Ivan Mazepa attempted to counteract the imperial policies of Peter the Great by allying with King Charles XII of Sweden. However, Peter the Great gained the military advantage, exacting brutal revenge on the rebellious Ukrainians, notably by burning the Cossack capital, Baturyn, to the ground. "Statistics on the losses of participants in the struggle for the freedom of Ukraine during the campaign of late 1708-1709. Up to 12-14 thousand were killed in Baturyn, and 3,000 in Perevolochna. Russian troops also burned (mostly with Cossacks and residents) Maiachka, Nekhvoroshch, Keleberda, Staryi Kodak, Novyi Kodak, Stari Sanzhary and Novi Sanzhary" (Stanislavsky, 2009).

For centuries, Russia intensified its policy of colonisation in Ukraine, using various methods to subjugate it. These included repression against the intellectual, cultural, and religious Ukrainian elite (including executions, imprisonment, torture, and enforced suicide). An internal migration policy was actively pursued to resettle and assimilate populations, thereby eroding historical and cultural traditions and severing ties with

local communities. As part of systemic oppressive measures, a ban was imposed on the use of the Ukrainian language in education, public culture, book publishing, and academic communication.

In 1622, Tsar Mikhail, at the suggestion of Patriarch Filaret of Moscow, issued an order to burn all copies of the Didactic Gospels by Kyrylo Stavrovetskyi, which had been printed in Ukraine. Repressive decrees and resolutions banning the Ukrainian language, culture, press, education, and church were later introduced by the Russian tsar, the Polish Sejm, Romanian authorities in western Ukrainian territories, and the Austro-Hungarian Empire in Eastern Galicia and Bukovyna. The notion that Ukrainian is merely a distorted form of Russian remains one of the dominant narratives of Russian propaganda. Throughout Ukraine's history as a stateless nation, more than fifty state acts of a repressive nature have been documented. By banning all expressions of national identity, the colonisers sought to maintain power over the subjugated population. Given these historical circumstances, it is remarkable that the Ukrainian language and culture have survived.

The explanation lies in the resilience of folk culture, which was preserved in a deeply embedded form within folk songs, rituals, customs, and crafts, particularly among the peasantry – the most conservative social stratum and the one most closely tied to its native land. "Chronologically, the emphasis on secrecy, preservation of conservative values, focus on the village and the people identified with the peasantry as the only bearers of national identity, on folklore, and kobzars as guardians of historical memory were not least a reaction to imperial pressure and the danger of assimilation" (Aheieva, 2021). During the Soviet era, however, the authorities sought to eliminate this threat as well. Repressive measures shifted from outright prohibition to systematic slander. Ukrainians became associated with the provinces, villages, and the uneducated lower classes. (The 1970 directive mandating that dissertations be defended exclusively in Russian is particularly illustrative in this context.) Consequently, assimilation processes intensified, fostering a transition to Russian identification under the promise of broader opportunities within the empire, transcending local and national boundaries. State cultural policy prioritised the promotion of Russian cultural products while cultivating a perception of provincialism, inferiority, and shame associated with non-Russian identity. The tragic nature of Ukrainian history is rooted in statelessness and the loss of opportunities for self-determination and unrestricted development. The hardships stemming from Ukraine's prolonged political subjugation to Russia were conceptualised differently by Ukrainian intellectuals of earlier generations: M. Drahomanov (1909) referred to it as "lost time", while D. Dontsov (1933-1939) characterised it as a "regime of the Mongol horde". Russia's full-scale war against Ukraine has intensified Ukrainians' efforts to overcome the consequences of their colonial past as a means of resisting the occupiers. This involves aligning the process of liberating Ukrainian territories with the simultaneous emancipation of Ukrainian consciousness from the remnants of colonial thinking, including the inferiority complex, worldview and linguistic stereotypes, as well as deep-seated behavioural and psychological traumas.

Strategies of postcolonial practices

The development of national education, science, and culture is a prerequisite for overcoming the consequences of colonisation. "National culture and national self-consciousness are the main features of a nation, without which it cannot exist and develop as a whole… they will play the role of an indicator of national development" (Morozova *et al.*, 2021). Scholars examining the colonial and postcolonial consequences of Ukrainian-Russian relations have documented systemic practices of prohibition and the denial of national subjectivity. This reflects the systematic and sustained imposition of a colonial mindset, enforced through various means: from prohibiting the use of the native language in the process of nation- and culture-building to the censorship of

Ukrainian-language materials and the denigration of Ukrainian ethnicity, relegating it to a secondary and inferior status. Notably, the repression of the Ukrainian language began immediately after Bohdan Khmelnytskyi signed the treaty establishing an alliance with Muscovy in 1654. In 1693, a ban was imposed on the import of Ukrainian publications to Muscovy, and censorship was introduced for Ukrainian book publishers. In 1709, the censorship of all Ukrainian books in Moscow became mandatory. In 1720, the printing of books in Ukrainian was completely prohibited. In 1784, the teaching of Ukrainian was forbidden at the Kyiv-Mohyla Academy. In 1863, the Valuev Circular was issued, banning the printing of primers, textbooks, scientific publications, and periodicals in Ukrainian. This had devastating consequences for Ukrainian primary education, leading to the closure of schools and the erosion of national and cultural identity. In 1876, the Ems Decree was promulgated, further strengthening the prohibition of the Ukrainian language. According to S. Ocheretianko & L. Ryabets (2024), by 1877, not a single book was published in Ukrainian. During the 1880s and 1890s, these restrictions were reinforced, advancing an ideology aimed at eroding national identity: children's books in Ukrainian, historical publications, and literature depicting the life of the intelligentsia were banned. Even certain words became classified as subversive or unacceptable: Ukraine, Zaporozka Sich, Cossack.

Attempts to elevate folk culture to the status of high, classical culture were actively obstructed. For centuries, Ukrainian culture existed primarily in the realms of folk, peasant, and naturalistic traditions. This characteristic was deliberately framed as evidence of the inferiority of Ukrainians, their supposed inability to develop more complex, abstract forms of thought and creativity beyond folklore. In reality, a systemic governmental policy of degradation, suppression, destruction, Russification, and assimilation was implemented. Through manipulative cultural policies serving imperial ideological interests, the notion was instilled at the level of public consciousness that everything valuable, high-quality, intellectual, modern, advanced, and developed was concentrated in the centre – in the capital.

Everything else was relegated to the periphery, dismissed as a rustic idyll, primitivism, backwardness, stagnation, and irrelevance. The members of the Cyril and Methodius Society characterised the Ukrainian nation as "crucified and tortured" yet always prepared to forgive its oppressors. M. Drahomanov (1894) employed this characterisation in constructing an ethnic portrait of a Ukrainian, stating that "A Ukrainian does not ask for much" and possesses a love "for all Slavs". Meanwhile, I. Franko described the spokespersons in the Ukrainian intelligentsia of the 20th century as possessing a "slave brain and a slave heart" (Dontsov, 1926).

The ongoing policies of assimilation and Russification in the Soviet Union are classified in contemporary scholarship as ethnocide and linguicide – forms of discrimination based on language and ethnicity. These policies were enacted covertly, through "soft" cultural strategies designed to "breaking systemic ties among the people and their main features (ethnic territory, language, culture, identity)" (Naulko & Hryniv, 2009). The emergence of high culture was deliberately suppressed, including through literal physical destruction. Among the numerous examples of this was the persecution of Taras Shevchenko and the repression of an entire generation of Ukrainian artists during the Soviet era – the so-called "Executed Renaissance" of the 1930s, followed by further repressions in the 1940s and 1960s). The Ukrainian writer Ostap Vyshnia documented the mass repressions of 1934 in his camp diary: "And who else? Who sings but Ukrainians? Everywhere now their songs are heard – in the taiga, in the tundra… If only they would not cry, let them sing!" (Kolomiets, 2019).

The intensity of the repressive machine is evidenced by the following: according to official USSR and Russian government statistics, in 1926, there were 7.4 million Ukrainians in Russia; in 1939, there were 3.07 million; in 1959,

2.86 million; in 1970, 2.57 million; in 2002, 2.03 million; and in 2010, 1.4 million. The rapid decline in these statistical figures cannot be explained only solely by the physical elimination of Ukrainians. In addition to repressive measures, the imperial authorities actively promoted and facilitated assimilation by encouraging the abandonment of the Ukrainian language and national identity in favour of Russian (or Soviet, in the USSR) identification. The idea was propagated that belonging to the majority was advantageous – more promising, profitable, and prestigious. In 2016, at the VI World Forum of Ukrainians, Ukraine's Vice Prime V. Kyrylenko, emphasised that the Russian Federation was pursuing a policy of denationalisation against Ukrainians living on its territory: "The issue of supporting Ukrainians in Russia is very relevant. About 10 million Ukrainians are living in Russia. But the last official Russian census showed a figure of 2 million, and the penultimate one had 3 million. A targeted policy is being implemented to denationalise Ukrainians in Russia: The Kremlin wants to make them enemies of their people and forget about their roots" (Veselova, n.d.). Destructive activities aimed at erasing Ukrainian identity were also carried out within Ukraine itself. These included both the direct recruitment and bribery of supporters of the "Russian world" by Russia, as well as more subtle efforts to maintain influence over the Ukrainian population – particularly through religious indoctrination via the Moscow Patriarchate. The practice of borrowing directly from Russian models was widespread across various spheres of Ukrainian political, social, cultural, and scientific life. The dominance of Russian-language communication in independent Ukraine was considered the norm until 24 February 2022. The full-scale war did not lead to the complete rejection of the occupier's language, and linguistic disputes remain contentious.

Colonialism as an intergenerational trauma

One of the methods used to subjugate colonised peoples is the manipulation of history and culture, distorting both the past and the present for ideological purposes. In the case of Ukraine, there has been a deliberate falsification of Ukrainian-Russian history to serve propaganda, manipulation, and psychological conditioning. Examples of such ideological distortions include narratives about the "brotherly" relationship between Ukrainians and Russians dating back to the times of Kyivan Rus, the supposed superior role of the "elder" Russian nation, shared Slavic roots, linguistic and religious affinity, and so forth. A particularly insidious tactic is the portrayal of Ukrainians as a people without a heroic past. According to this narrative, Ukrainian history is merely a chronicle of defeats, suffering, and yearning, with Ukrainians depicted as helpless people devoid of their own heroes. Success, it is claimed, can only be achieved through unity with so-called "brotherly" nations. In this way, historical examples of Ukrainian resistance to enslavement have been systematically suppressed, and the nation's history has been reduced to a simplistic and primitive narrative, stripping Ukrainians of their right to national heroes, identity, and dignity. As a result, an inferiority complex was instilled in Ukrainians, reinforcing the stability of imperial rule.

The manipulation of history also served as an attempt to legitimise colonial dominance by erasing references to prominent Ukrainian historical figures, national heroes, and the continuous struggle for freedom and sovereignty. Various methods were employed to discredit, defame, demonise, and degrade historical figures such as S. Bandera, S. Petliura, R. Shukhevych, N. Makhno, and others. A common practice involved erasing all documentary evidence of oppositionists and dissidents while charging them with criminal rather than political offences. The Soviet authorities proclaimed to the world that there were no political opponents in the USSR. In this context, one of the forms of resistance of the prisoners was the struggle for recognition as political prisoners and demand for the appropriate legal status (Bazhan, n.d.). The principal methods used to suppress dissent included isolation, public

condemnation, forced recantation, and orchestrated denunciations by representatives of the "progressive public". The state also employed coercive measures to neutralise disobedient individuals, including forced psychiatric treatment, psychological pressure leading to suicide, death by illness, or staged "accidents". Another key strategy was the information blockade, aimed at obstructing the heroisation of dissidents. The deliberate suppression of information facilitated mass control by fostering the illusion of unanimous support for the regime. The authorities also classified or destroyed archival records to ensure impunity for those involved in the repressive apparatus. As a result, the identities of many Ukrainian dissidents remain unknown.

The Ukrainian writer and public figure O. Zabuzhko (2022) characterised the traumatic experience of Ukrainians throughout the 20th century as an "intergenerational trauma" of famines, dekulakisation, executions, arrests, exile, deportation to the northern regions or Siberia, resettlement zones, persecution for dissent, denial of rights, public humiliation, and so on. This trauma represents the memory of several generations facing physical danger when publicly recognising their national and cultural identity, economic viability, and so on. The persistent "city-village" opposition became widespread, with the village being endowed with inferior characteristics. Thus, in 1922, the "theory of the struggle in Ukraine between two cultures" – urban (Russian) and peasant (Ukrainian) – was proclaimed, with the former intended to prevail (Kubaichuk, 2004). The fact that the village was not certified until the early 1970s, meaning that peasants were tied to their place of residence, preserving the traditions of serfdom (which had been legally abolished in 1861 but persisted for another century), further intensified this opposition. The trauma was so profound that it was not discussed even within families due to the potentially dangerous consequences. As a result, the Russian language almost completely replaced Ukrainian in the communicative space. Initially, it was used for public communication, but it later infiltrated the family life of Ukrainians. Mothers began reading bedtime stories to their children in Russian. The effectiveness of this educational and cultural policy must be acknowledged, as the ideology of the superiority of the Russian language and culture was reinforced from childhood. In this way, the blurring of Ukrainian identity was achieved: a complex of national inferiority was formed using "soft pressure". The widespread establishment of Russian-language schools contributed to the perception that Ukrainian was a fringe language of the lumpenproletariat, which excluded it from educational and scientific discourse. Cultural products containing national features were devalued. On the one hand, this was facilitated by the predominantly folk nature of creativity (which was equated with primitiveness), while on the other, cultural products of Russian origin were given priority in terms of financial and media support and distribution.

Through the media, cinema, television, and literature, the "Russian – non-Russian" opposition was constructed with subtle irony, in which the non-Russian was always depicted as possessing a set of deviations, perversions, or absurd shortcomings, while the Russian embodied all the most idealised characteristics of a successful modern individual. However, after the collapse of the USSR, the successful use of soft cultural influence did not prevent Russia from conducting military operations against various regions of its disintegrating empire. In the 30 years since the USSR's collapse, Russia's record of military aggression has included the Russian-Georgian War, two Chechen Wars, and military conflicts in Abkhazia, Transnistria, Ossetia, Tajikistan, and Dagestan, as well as, since 2014, the war against Ukraine. The actions of the Russian occupiers in Ukraine were recognised by the Ukrainian authorities and the governments of several other states (including Poland, Estonia, Latvia, Lithuania, Canada, the Czech Republic, and the United States) as genocide – a crime committed not only physically against the victims but also

against their historical memory and culture (De Waal, 2015). Other victims of Russian aggression, including representatives of the Georgian and Armenian peoples, also call on the democratic world to condemn Russia's actions as genocide. Political and legal analysis of such relations demonstrates their totalitarian and colonial nature (Stezhko *et al*., 2021; Kultenko *et al*., 2022).

Researchers describe Ukrainian identity as more open in comparison to the conservatism of cultural identification in the so-called "Old Europe". This openness to the world and willingness to welcome a friendly outsider into one's inner circle is attributed to Ukraine's geopolitical position as a crossroads of different trade routes (from the Varangians to the Greeks), cultural movements, and so forth. Ukraine has traditionally been a bridge between East and West, South and North, and a crossroads for intercultural communication. Therefore, Ukrainians are more open to integration, renewal, and change. It is important to draw the right conclusions about Ukraine's colonial past and to critically examine this issue within global philosophical and political discourse. Specifically, it is necessary to acknowledge the colonial nature of Ukraine's relationship with Russia over the past 350 years, which has shaped the dynamics of these interactions. An objective study of history is required to address historical omissions and to rehabilitate unjustly persecuted and deliberately discredited historical figures. Particular attention should be given to reintegrating into the nation's cultural life the philosophical, literary, artistic, and musical works of repressed Ukrainian figures, thereby promoting and popularising Ukrainian culture, language, creativity, and a respectful attitude towards them. The slogan "Ukraine above all!" is prominent in contemporary Ukrainian discourse.

The presence or absence of several key factors in both the metropole and the colony traditionally defines colonialism. Among these factors are: the presence or absence of political power and control; inter-racial or inter-ethnic tensions regarding the right to establish and interpret meanings; significant disparities in the political, economic, and socio-cultural conditions of different races or national communities; and laws that discriminate on ethnic or racial grounds within specific borders. Additionally, colonial societies are often characterised by their closed nature, the marginalisation of the colonised population, and the colonisers' privileged authority over semantics, textuality, language, and the definition of processes and phenomena. Postcolonial studies of Ukraine's sociopolitical landscape allow for an expansion of the traditional list of colonisation factors, incorporating such specific elements as the use of culture as a tool of manipulative influence and soft coercion, as well as the widespread application of ideological clichés to further colonial objectives.

Conclusions

In contemporary Ukrainian society, the conflict between former colonies and colonisers is not merely a cultural or socio-political struggle. Rather, it involves systematic efforts to sever fundamental ties that define a nation – its ethnic territory, language, culture, and national consciousness). The coloniser, in defiance of the natural tendencies of imperial decline, seeks by all means to preserve its spheres of influence and retain control over the political, economic, historical, and socio-cultural domains of the metropole. This drive for preservation, combined with authoritarian traditions of organising social and political life, manifests in distorted historical narratives, the imposition of an inferiority complex upon subjugated peoples, and the systemic implementation of policies of genocide, denationalisation, and assimilation. These strategies serve to sustain influence and control. The deliberate falsification of Ukrainian history, the erasure of heroic national narratives, and the reinforcement of negative stereotypes have contributed to a deep-rooted intergenerational trauma, profoundly affecting Ukrainian identity and self-perception. This trauma, compounded by ongoing military aggression, underscores the

urgency of decolonising Ukrainian consciousness. The path forward necessitates a comprehensive approach. Beyond simply rejecting the remnants of imperial culture, aesthetics, norms, and standards, Ukraine must assert its right to self-representation. The struggle for political independence is intrinsically connected to the liberation of Ukrainian consciousness from the residual effects of colonial ideology.

The prospects for further research lie in moving beyond the rejection of imperial culture categories – its aesthetics, norms, and standards – towards categories of the right to self-expression and the privilege of a free nation to represent itself. After all, Ukrainians are engaged in an armed struggle for their right to political independence and self-governance, for historical truth, and for their voice in global cultural and political discourse. This concerns the opportunity to construct their own textuality, shape national identity, interpret history, and preserve historical memory, along with national heroes and leaders. It also involves ensuring the transmission of cultural traditions, building a distinct culture of everyday life and family values, and developing the Ukrainian language as a means of safeguarding national interests. These efforts are essential for constructing a postcolonial narrative that allows for the interpretation of meanings, worldviews, values, emotions, and the plurality of creative expression. The normalisation of these processes facilitates the recognition and acceptance of the Other without resorting to demonisation or humiliation. A logical extension of this is the formulation of objectives for Ukrainian cultural diplomacy, which is oriented towards European integration, introducing Europeans to Ukraine's cultural heritage, fostering mutual exchange, and promoting cross-cultural enrichment. After all, Ukraine has unequivocally expressed its political will to join the EU. This choice is guided by the civilisational priorities of Ukrainians, who seek to live and work in an open, democratic, and legally governed society.

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Conflict of Interest

There is no conflict of interest.

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Явище колоніалізму та постколоніалізму в контексті сучасних українських реалій

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Анотація. Коли українські дослідники стверджують, що політика Росії щодо України була колоніальною, це твердження часто ставиться під сумнів західними вченими. Російсько-українські відносини не зовсім вписуються в таку модель. Тому ключовим питанням цього дослідження було: наскільки виправданим є визначення російсько-українських відносин як колоніальних, зважаючи на те, що теперішній та майбутній розвиток України значною мірою залежить від деколонізації української свідомості? В цьому дослідженні визначено поняття «колоніалізм», обґрунтовано тезу про те, що Україна була колонізована Росією, і розроблено практики деколонізації. Для досягнення цієї мети в дослідженні використовувались емпіричні методи, а також теоретичні методи дослідження, зокрема аналітичний, синтетичний, феноменологічний та філософська рефлексія. Крім того, використано міждисциплінарні методи дослідження, такі як кейс-стаді, комеморативний, філософський та історичний аналіз. Україна переживає постколоніальний стан, який є наслідком її історичної бездержавності, залежності від Росії та системної політики денаціоналізації, нав'язаної метрополією. Ця політика включає нав'язування комплексу меншовартості, придушення претензій на українську мову, культуру та еліту, руйнування національної гідності та асиміляцію з домінуючою імперською ідентичністю. Якщо імперії розпадаються під тиском об'єктивних чинників, то Росія як імперський центр активно протистоїть цим процесам – передусім через відкриту військову агресію, диверсії та інформаційну війну, включно з психологічними маніпуляціями. Постколоніальний стан українського суспільства проявляється у фрагментарній національній самоідентифікації, нестійкій системі цінностей, порушених культурних кодах, глибоких психологічних кризах на архетипному рівні свідомості. Це знаходить своє відображення у мовних суперечках, релігійних конфліктах та інших соціокультурних напруженнях. Практичне значення дослідження полягає у висновку, що подолання негативних постколоніальних наслідків є необхідним для досягнення свободи, просування європейської інтеграції, зміцнення національної ідентичності та утвердження гуманістичних цінностей. Дослідження було спрямоване на звільнення української свідомості від постімперських маніпулятивних практик

Ключові слова: постколоніальні практики; етноцид; лінгвоцид; маніпулювання історією; соціокультурні трансформації; історична травма; національна ідентичність

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