QUALITY OF LIFE

IN THE GLOBAL UNCERTAINTY

DIMENSIONS

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Quality of Life
in the Global Uncertainty Dimensions

Monograph

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Relevance of the Study. A country's success in scientific and technological development directly depends on the quality of teacher training, particularly on educators capable of fostering in schoolchildren an interest in exploring the world through the lens of science, technology, engineering, and mathematics. The teacher plays a key role in stimulating the intellectual and creative potential of children and youth, awakening their curiosity toward research activities, engineering design, and the use of modern technologies to solve applied problems. An effective tool for such educational renewal is STEM education.

STEM (Science, Technology, Engineering, and Mathematics) represents a modern didactic approach based on the integration of interdisciplinary practices and problem-based learning methods in the teaching of natural and mathematical sciences. With the development of educational innovations, the component Arts was added to this model, forming the STEAM approach, which aims to include creative and artistic disciplines within the framework of scientific and technical education. These areas include industrial design, architecture, and industrial aesthetics, among others. In the European educational discourse, a broader interpretation of STEAM has emerged, viewing it as a combination of all educational fields (A – *All*), emphasizing the importance of a comprehensive integration of scientific, technical, humanitarian, and artistic components in educational programs.

STEM education functions not only as a field of study but also as a pedagogical technology focused on developing transversal skills such as problem-solving, critical and systems thinking, creativity, cognitive flexibility, teamwork, as well as managerial and innovative abilities. This approach enables students to think in the context of real-world challenges and to create solutions that combine scientific knowledge, engineering reasoning, and technological tools.

Thus, the ability to integrate the STEM approach into the educational process determines whether the next generation will be ready not only to consume existing knowledge but also to create innovations. In this context, the integration of STEM disciplines into teacher education programs becomes a key condition for developing the competencies necessary for implementing STEM-oriented pedagogical activities.

In our view, the implementation of the STEM approach should not be limited to teachers of science and mathematics. Contemporary educational practice demonstrates that teachers of humanities can also effectively contribute to the formation of STEM competencies among students by integrating elements of research and technological activities into their subjects.

The aim of this study is to analyze the presence and nature of STEM components in educational programs of both humanitarian and non-humanitarian fields offered by Ukrainian higher education institutions (HEIs).

The methodological framework of the research is based on contemporary pedagogical theories that emphasize systemic, competence-based, and interdisciplinary approaches to teacher education. The study employs a qualitative content analysis of educational programs from various Ukrainian HEIs in order to identify the presence and specifics of STEM integration within the structure of future teacher training.

The study analyzed over thirty educational programs at the first (bachelor's) and second (master's) levels in the field of *Education* (according to the Resolutions of the Cabinet of Ministers of Ukraine No. 1021 of August 30, 2024, and No. 266 of April 29, 2015), as well as several programs in the humanities and natural-mathematical sciences profiles that include teacher training components. The empirical base consisted of open educational resources: official university websites, electronic repositories of educational documentation, public curricula, and course descriptions.

To process the data, content analysis was used, involving the examination of program structures, learning outcomes, course content, and methods of implementing interdisciplinary connections. A comparative analysis allowed for identifying the specific features of integrating STEM disciplines into pedagogical, humanitarian, and science-oriented programs, as well as differences between the bachelor's and master's levels.

The criteria for determining the presence of STEM components included:

1. Availability of courses or modules aimed at developing digital literacy, technological culture, analytical and critical thinking.

2. Reflection of STEM approaches in the program learning outcomes (emphasis on research, project-based, and practice-oriented activities).

3. Interdisciplinary nature of course content (integration of scientific, technical, and humanitarian fields).

4. Inclusion of practical or research-based project work focused on solving applied scientific problems.

The findings are presented to identify trends in the integration of STEM disciplines into teacher education and to develop recommendations for further modernization of educational programs.

Research Results. Today, Ukraine has established a fairly robust regulatory and legal framework for the implementation of STEM education, including the following:

- Laws of Ukraine: *On Education, On Complete General Secondary Education*, *On Extracurricular Education*, *On Scientific and Scientific-Technical Activity, On Innovation Activity*, *On Culture*;
- The State Standard for Primary Education, approved by the Resolution of the Cabinet of Ministers of Ukraine dated February 21, 2018, No. 87;
- The State Standard for Basic Secondary Education, approved by the Resolution of the Cabinet of Ministers of Ukraine dated September 30, 2020, No. 898;

- *Strategy for the Development of the Innovation Sphere until 2030*, approved by the Order of the Cabinet of Ministers of Ukraine dated July 10, 2019, No. 526-r;
- *Strategy for the Development of Higher Education in Ukraine for 2022-2032*, approved by the Order of the Cabinet of Ministers of Ukraine dated February 23, 2022, No. 286-r;
- The Concept for Implementing State Policy in the Reform of General Secondary Education *"New Ukrainian School"* until 2029, approved by the Order of the Cabinet of Ministers of Ukraine dated December 14, 2016, No. 988-r;
- The Concept for the Development of Natural Science and Mathematics Education (STEM Education), approved by the Order of the Cabinet of Ministers of Ukraine dated August 5, 2020, No. 960-r;
- The Action Plan for Implementing the Concept for the Development of Natural Science and Mathematics Education (STEM Education) until 2027, approved by the Order of the Cabinet of Ministers of Ukraine dated January 13, 2021, No. 131-r;
- The Action Plan for Promoting Natural Sciences and Mathematics until 2025, approved by the Order of the Cabinet of Ministers of Ukraine dated April 14, 2021, No. 320-r;
- Regulations on the Procedure for Implementing Innovative Educational Activities, approved by the Order of the Ministry of Education and Science of Ukraine dated November 7, 2000, No. 522, registered with the Ministry of Justice of Ukraine on December 26, 2000, No. 946/5167 (as amended by the Order of the Ministry of Education and Science, Youth and Sports of Ukraine dated November 30, 2012, No. 1352);
- Order of the Ministry of Education and Science of Ukraine dated October 16, 2019, No. 1303 *"On Approval of the Standard for Specialized Education of a Scientific Orientation"*;

- Order of the Ministry of Education and Science of Ukraine dated August 29, 2024, No. 1225 *"On Approval of the Professional Standard 'Teacher of a General Secondary Education Institution"*;
- Order of the Ministry of Education and Science of Ukraine dated April 29, 2020, No. 574 *"On Approval of the Typical List of Teaching Aids and Equipment for Classrooms and STEM Laboratories"*, among others.

Thus, the established regulatory and legal foundation not only regulates processes in the field of STEM education but also defines strategic directions for its practical implementation. At this stage, the implementation aspect becomes crucial – ensuring mechanisms and allocating resources that support the integration of the STEM approach into Ukraine's educational space. Accordingly, in line with the Concept for the Development of Natural Science and Mathematics Education (STEM Education), scientific institutions and educational establishments in Ukraine focus on the following priority actions:

- The planned creation of a network of regional STEM centers to provide informational and methodological support for students' learning activities; each regional STEM center is expected to have working groups of developers, experts, and educational process moderators;
- Formation of a network-centric environment of STEM centers to support science-oriented education aimed at modernizing mathematics, natural sciences, and humanities education;
- Coordination of methodological and software-information resources for teaching;
- Organization of international, national, and regional conferences, seminars, webinars, and round tables for teachers, methodologists, moderators of STEM center educational processes, educational institutions at various levels, developers, and experts;

- Creation of virtual platforms for interdisciplinary laboratories to connect Ukrainian educational institutions to the STEM center network;
- Ensuring the availability of educational and methodological resources for effective implementation of STEM education in Ukraine (*Concept for the Development of Natural Science and Mathematics Education*, 2020).

Despite the presence of a robust regulatory and legal framework aimed at developing and promoting STEM education, its provisions are not yet consistently reflected in professional teacher training programs. Analyses of instructors' and students' perspectives indicate a significant gap between state initiatives and their implementation in teacher education (Mytsyk, et al., 2024; Nesterenko, et al., 2025; Petryk, et al., 2024), (Nesterenko, et al., 2024). As a result, future teachers do not acquire the necessary competencies for effective implementation of the STEM approach, which complicates the achievement of strategic goals of contemporary Ukrainian education related to cultivating a scientifically oriented and technologically competent generation.

This situation necessitates a more thorough analysis of the current state of teacher preparation for STEM-oriented professional activity, including examining pedagogical universities' curricula, determining the level of STEM integration in the learning content, and evaluating its alignment with the requirements of an innovative educational environment.

At *Berdyansk State Pedagogical University*, professional training of future teachers is carried out through 34 educational and professional programs at the first (bachelor's) level and 23 programs at the second (master's) level of higher education.

One of the most consistently STEM-oriented educational programs is the bachelor's program in specialty 014.09 "Secondary Education (Informatics)", implemented by the Faculty of Physical, Mathematical, Computer, and Technological Education. The structure of the program itself demonstrates its focus on developing integrated competence, related to solving complex specialized problems in the field

of information and communication technologies and in teaching informatics in general secondary education institutions.

An analysis of the program's goals, focus, and structure reveals its clear orientation toward forming in future teachers the ability to combine pedagogical activity with technological thinking, an understanding of the functioning of the digital educational environment, and the use of modern teaching methods in informatics. A particularly valuable feature of this program is the explicit inclusion of STEM education in teacher training. Specifically, the program includes educational components directly related to STEM competency development, such as "STEM Education and Robotics" (5 ECTS credits) and "Production Internship (in Robotics and STEM Education Clubs)" (9 ECTS credits). The very presence of such components within the cycle of professional training is a positive indicator.

The content of the discipline *"STEM Education and Robotics"* reflects a focus on the practical application of theoretical knowledge – students learn to work with hardware and software tools, develop instructional models, and design methodologies for integrating elements of robotics into the educational process. The learning outcomes – such as the ability to solve practical problems based on the integration of knowledge about computer systems, select and apply modern digital tools, and organize systems for learning assessment – correspond directly to key characteristics of the STEM approach (interdisciplinarity, practical orientation, and inquiry-based learning).

An equally important component of the program is the production internship, aimed at applying knowledge in real educational environments. The internship in robotics and STEM clubs promotes not only methodological but also organizational and pedagogical competencies, including the ability to design educational projects, implement digital technologies, and foster students' creativity and technical imagination. Analysis of the learning outcomes shows an emphasis

on developing skills in information search, analytical thinking, digital communication, and adherence to ethical and social norms in the use of technology.

It is important to emphasize that the structure of competencies and expected learning outcomes demonstrates a balanced combination of theoretical and practical components of training: future teachers not only acquire knowledge of digital technologies but also develop the ability to implement them.

At the same time, it is evident that while the STEM component is integrated, it remains fragmentary – represented by only one course and one internship – whereas most other educational components continue to focus primarily on classical informatics teaching methods. To foster systemic STEM-oriented thinking, it would be appropriate to strengthen interdisciplinary connections across all professional modules, integrating project-based learning, research methods, and digital simulations into core courses.

Thus, the educational and professional program “Secondary Education (Informatics)” demonstrates high potential for implementing STEM-oriented teacher training, as it already includes components that develop relevant competencies. However, further improvement of the program requires expanding its interdisciplinary content to ensure more comprehensive integration of STEM across all levels of professional training for future educators.

The educational and professional program “Primary Education” of the second (master's) level of higher education, implemented by the Faculty of Psychological, Pedagogical Education and Arts, has a distinctly humanitarian and pedagogical orientation. Its goal is to train a highly qualified primary school teacher who possesses innovative thinking, creativity, and readiness to operate within any educational reform framework, particularly that of the New Ukrainian School.

Tte educational and professional program combines traditional pedagogical approaches with a focus on the modern requirements of innovative education; however, an analysis of its structure shows that the STEM component is only partially

represented – within the certificate program "Informatics and Its Teaching Technologies", which has an elective status. This means that mastering the course *"STEM Education and the Basics of Robotics in Primary School"* is not mandatory for all master's students. Such an organizational model, while allowing for individualized educational trajectories, limits the scope of STEM training to only those who voluntarily choose this elective.

The content analysis of this discipline reveals significant potential for developing in future teachers the competencies necessary for implementing the STEM approach in primary education through learning outcomes such as: "to create an innovative information and educational environment in primary school using STEM technologies," and "to organize and manage the educational process with the use of innovative technologies."

However, the fact that STEM-oriented preparation is implemented through only one elective discipline indicates a lack of systematic integration of the STEM approach into the professional training of future primary school teachers. Some students acquire basic knowledge of robotics and STEM principles, while others remain outside this innovative framework.

Nevertheless, the inclusion of *"STEM Education and the Basics of Robotics in Primary School"* in the master's curriculum represents a significant step toward modernizing teacher education. Its content focuses on developing students' creativity, digital literacy, and project-based learning skills. The set of general and professional competencies reflects a trend toward integrating pedagogical, technological, and research activities – fundamental for the development of STEM-thinking.

At the same time, the absence of a cross-cutting STEM component integrated into the program's core professional courses reduces its potential for systematically forming future teachers' readiness to implement STEM education in primary school. This approach currently corresponds more to a facultative rather than a strategic model of STEM integration. To enhance the effectiveness of training, it would

be advisable to expand STEM content through interdisciplinary modules, joint courses in pedagogy, psychology, and science education methodology, as well as to create opportunities for practical application of STEM technologies during teaching practice.

Thus, the educational and professional program *"Primary Education"* demonstrates a positive trend in preparing future teachers for STEM-oriented professional activity; however, its implementation remains limited, due to the elective nature of the course and insufficient integration of STEM ideas into the overall program structure.

An overall analysis shows that among all the educational and professional programs at Berdyansk State Pedagogical University, only two *"Secondary Education (Informatics)"* and *"Primary Education"* include courses directly dedicated to STEM education. Even in these cases, the STEM component remains fragmentary, represented by individual subjects rather than by a consistent integration throughout the curriculum. This level of implementation does not yet ensure systematic preparation of teachers for the realization of the STEM approach in school education.

At Ternopil Volodymyr Hnatiuk National Pedagogical University, professional training is carried out across ten faculties that cover a wide range of specialties in pedagogical, natural-mathematical, humanitarian, and artistic fields. In total, the university offers 75 educational and professional programs at the bachelor's level and 63 programs at the master's level of higher education.

At the Faculty of Physics and Mathematics (Department of Computer Science and Methods of Its Teaching), future specialists are trained in educational programs that include STEM disciplines at both the first (bachelor's) and second (master's) levels of higher education. Let us consider each of them in more detail.

First of all, the bachelor's educational and professional program "Secondary Education (Computer Science, Mathematics, Fundamentals of STEM Education)"

stands out for its integrated approach to developing dual subject competence and incorporating the STEM approach into the training of future computer science teachers. The program combines in-depth theoretical preparation in computer science and mathematics with a practical focus on the use of technology in school education. It emphasizes interdisciplinarity, which is reflected in the integration of natural and mathematical content with methodological and technological aspects of teaching.

The STEM component of the educational and professional program is implemented through two key educational courses: “Methods of Teaching Computer Science and STEM Education” and “Project and Technological Practice in STEM Education”, each worth 6 ECTS credits. The first course combines methodological training with elements of technological and research thinking. Its content focuses on developing the ability of future teachers to model the educational process according to the STEM approach, design learning projects, apply innovative digital learning tools, and integrate computer science and mathematics in teaching practice. The program learning outcomes demonstrate a strong link between theoretical mathematical training and its practical application in a STEM context – through the use of algorithmic thinking, systems analysis, programming knowledge, and physical principles for creating educational projects and technical models.

The Project and Technological Practice, in turn, ensures the development of skills to implement the STEM approach in a real educational environment. Its content aims to foster leadership, innovation, and research competencies, as well as the ability to work with cloud technologies, design information systems, and organize learning through practical activity and experimentation. Particular attention is paid to the ability of future teachers to implement integrated teaching, apply interdisciplinary links, and lead STEM clubs or laboratories.

Overall, the educational and professional program is characterized by a high degree of practical orientation and technological intensity. It prepares students not only to teach computer science and mathematics but also to design and manage

STEM projects. At the same time, the STEM component is concentrated within two disciplines and does not fully cover other professional modules. Therefore, despite its potential, the program requires further structural optimization to ensure that STEM becomes the core of the entire educational trajectory.

The second educational and professional program, “Secondary Education (Computer Science, Mathematics, STEM Education)” at the master’s level, is designed to prepare computer science and mathematics teachers with advanced IT training and a research focus. Its declared goal – to enable graduates to analyze and synthesize complex systems and conduct scientific research using modern information technologies and methodologies – aligns well with the master’s level and the digital competence framework.

The STEM block includes two courses: “Methods of Teaching Computer Science and STEM Technologies” (6 ECTS credits) and “Project and Technological Practice in STEM Education” (3 ECTS credits). The first course provides a methodological foundation (combining ICT, mathematics, and pedagogy; designing innovative educational environments; inclusion), while the second ensures the acquisition of practical skills in a real educational context. As can be seen, STEM is integrated across a total of 9 ECTS credits, with only 3 credits allocated to practice – insufficient for the sustainable development of engineering and design skills in master’s-level teachers capable of effectively implementing the STEM approach. Computer science and mathematics methodology dominate, while interdisciplinary courses are absent.

Hence, there is a clear need to enhance the “cross-cutting” nature of STEM by incorporating project-based and research modules into core courses on teaching methodology in computer science and mathematics; to increase the volume of practical training (with real STEM cases, interdisciplinary projects, and maker challenges); and to refine learning outcomes and align them with measurable performance indicators (project portfolios, prototypes, digital products). This would

significantly strengthen the quality of master's-level teacher education in accordance with current educational priorities.

The Ukrainian State University of Science and Technology provides training for future specialists in 41 educational and professional programs at the first (bachelor's) level of higher education and 38 programs at the second (master's) level of higher education.

At the Faculty of Computer Technologies and Systems (Department of Physics and Applied Mathematics), students are trained under the bachelor's program "STEM Education" within the specialty 014 Secondary Education (by subject specializations), subject specialization 014.08 Secondary Education (Physics and Astronomy), in the field of knowledge 01 Education/Pedagogy.

The program declares a priority in preparing teachers of the natural and mathematical profile capable of integrating physics, mathematics, and computer science within the logic of STEM / STEAM education. Its structure includes fundamental training in three subject areas, a psychological and pedagogical block, and practice-oriented modules. It also provides for interdisciplinary research, project-based learning, and innovative forms of education.

The core of the STEM component lies in two professional disciplines: "Fundamentals of STEM Education" (8 ECTS credits) and "STEM Practice" (6 ECTS credits). The first course develops the methodological and instrumental foundation (integration of physics, mathematics, and computer science; modeling; use of information and communication technologies), while the second provides an opportunity to apply the acquired competencies in real educational settings (project tasks, computer experiments, organization of extracurricular activities).

The strengths of the program include a significant scope of both the core discipline and the practicum (8 and 6 credits, respectively), as well as its focus on real-life cases (extracurricular formats, clubs, projects). Under these conditions,

the program has better potential to prepare teachers capable of organizing interdisciplinary learning and leading STEM-related activities.

However, these are still only two courses totaling 14 credits out of 240 in the entire bachelor's curriculum. In many other subject and methodological disciplines, integrative approaches are not clearly defined. Furthermore, the declared STEAM orientation is not sufficiently supported by explicitly articulated artistic or design components.

At the Kryvyi Rih State Pedagogical University, among 49 bachelor's and 37 master's educational programs, several are closest to implementing the objectives of the Concept of Natural-Mathematical (STEM) Education.

First of all, at the Faculty of Physics and Mathematics (Departments of Physics and Methods of Its Teaching; Informatics and Applied Mathematics), students are trained under the bachelor's program "Physics and Astronomy. Mathematics." It focuses on preparing teachers capable of organizing and conducting the educational process in physics, astronomy, and mathematics, solving complex specialized tasks. The STEM component is represented by a single professional discipline – "STEM Practices in Education" (3 ECTS credits) – aimed at the integrated application of theories and methods from different subject specializations (declared as an integrative competence).

The list of program learning outcomes partially correlates with STEM education goals, for example, knowledge of modern educational and information-digital technologies in teaching methodology and the ability to organize student projects and activities. However, this is insufficient, as many competencies remain general, and the mechanisms of cross-curricular integration are not concretely defined.

A similar situation is observed in the bachelor's educational and professional program "Informatics. Programming", which also includes only one professional discipline supporting the development of integrative competencies and preparing graduates to implement STEM approaches in educational institutions. This course,

“STEM Practices in Education” (4 ECTS credits), connects subject-specific computer science training, methodology of teaching informatics, and the practical implementation of technologies in the school environment.

On the one hand, strengthened IT-oriented professional preparation potentially enables the formation of modern teachers capable of creating and maintaining a digital educational environment and initiating school projects with programming components. On the other hand, the STEM content is limited to a single 4-credit course, which is insufficient for full-fledged, science-and-technology-oriented learning, as STEM education extends beyond digital technologies alone.

At the Faculty of Pedagogical Education (Department of Technological and Vocational Education), future professionals are trained at the bachelor’s level under the unique educational and professional program “Technologies. STEM Education. Robotics” (specialty 014.10 Secondary Education (Technologies)) and at the master’s level under the program “Technologies”.

The main focus of this educational and professional program is general education within the specialty 014.10 Secondary Education (Technologies), which prepares teachers for general secondary schools, specialized education (technologies), and instructors for institutions of professional pre-higher education. The program integrates psychological-pedagogical, methodological, and project-based preparation of future technology teachers, taking into account current innovation-oriented requirements and the use of STEM technologies in education.

This training is already structured as a continuous trajectory: the bachelor’s program, with a clear focus on STEM and robotics, and the master’s program “Technologies,” aimed at deepening project-engineering, methodological, and digital components. Its distinctive feature is the integration of psychological-pedagogical, methodological, and project-based preparation with the implementation of STEM technologies in educational institutions.

However, the STEM component in the master's educational and professional program is represented by only one course – "STEM Technologies in Technological Education" (3 ECTS credits), which forms the ability to organize practical and transformative activities, perceive and implement technological innovations, apply digital/computer-aided design, modeling, project management, and use STEM innovations in professional practice. Yet, cross-curricular integration of STEM into core methodological and specialized disciplines is not observed, nor are the program learning outcomes detailed enough to confirm graduates' readiness to organize laboratory or maker-style learning formats.

Thus, this bachelor's STEM-oriented technological training and master's project-engineering specialization form a coherent tandem, yet the overall scope and cross-cutting integration of STEM remain insufficient.

Conclusions. The synthesis of the obtained results shows that the integration of STEM into pedagogical educational and professional programs in Ukraine still has a predominantly point-based and fragmented character. The modernization goals declared in regulatory documents are being implemented unevenly in the practice of teacher training: in some programs, there are individual strong modules with clear logic; however, they function more as supplements rather than as a cross-cutting principle of curriculum design. As a result, STEM often becomes an "external add-on" rather than a constructive foundation for forming teachers' professional competencies.

A typical trend is the representation of STEM through a single course of 3-6 ECTS credits, and less frequently through two interconnected components (methods + practice) totaling 9-14 ECTS credits. Under such proportions, the share of STEM in the overall structure of the program is insufficient for stable acquisition of the necessary organizational skills. There is also a noticeable shift toward digital literacy and programming, which partially replaces the broader content of STEM

(engineering design, material and technical aspects, experimentation and simulation, design thinking, data handling, and result validation).

Particular attention should be paid to how STEM is embedded in curricula: in most cases, relevant courses are mandatory, yet there are also models where STEM is offered as an elective or as part of a certificate program. In such configurations, coverage decreases significantly: some master's students complete their studies without basic STEM competencies, which prevents systematic implementation of the approach in school practice and creates institutional inequality in teacher training.

A comparison between levels of education reveals different risk profiles. In bachelor's programs, where two-component solutions with a strong practical focus (e.g., "Fundamentals of STEM" + "STEM Practice") are more common, better conditions are created for interdisciplinary tasks, extracurricular and lab work, and mini-projects. Conversely, in master's programs, STEM is usually represented by a single course with minimal practical content; methodological and research rhetoric dominates without sufficient scientific and technical training in real educational environments. As a result, master's students often demonstrate ideological readiness for innovation but lack a well-developed set of procedures, tools, and assessment criteria to lead full-scale STEM projects with pupils.

Summarizing the issue, it is important to highlight several key challenges: the formal inclusion of STEM (lack of cross-cutting integration into core subject and methodological courses, weak connection with final assessment); the substitution of STEM with IT components (narrowing it to digital tools and coding without the engineering and experimental dimension); insufficient practice, especially at the master's level; and the absence of thoughtful integration in humanities programs. Overcoming these limitations requires correction on two levels. At the program level, it is advisable to move from the "one course = STEM" model to a cross-cutting structure: at least three mandatory STEM modules at different

stages of training with a significant practical share. STEM should be embedded into core disciplinary and methodological courses through mini-projects, digital labs, simulations, and maker tasks.

At the system level, coherent frameworks are needed. It is recommended to establish regulatory minimums for required STEM credits and the share of project-based/practical activities in teacher education programs of different levels; to ensure targeted funding for STEM infrastructure in universities (laboratories, robotics, microcontrollers, sensors, etc.) with guaranteed access for all students; and to launch professional development programs for university instructors in engineering design for education, digital experimentation, design thinking, and interdisciplinary supervision of student projects. Additionally, it is necessary to develop methodological packages with examples of integrated tasks, a national open repository of STEM cases, and to include STEM indicators in internal quality assurance systems, supported by grant and staffing incentives for effective implementation.

Thus, it can be stated that STEM integration today is largely insufficient in terms of systemic depth and practical orientation. To ensure that graduates are truly ready to implement STEM-oriented pedagogical activities, a transition is required from episodic courses to a structural, integrated, and practice-oriented model of teacher education across disciplines, supported by a coherent state and institutional policy.

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Annotation

Chapter 1. Psychosocial factors and personal resources in times of crisis

1.1. ***Liudmyla Chernukha, Nataliia Hresa***. **Value-semantic resources of personality as a factor of enhancing quality of life in conditions of global uncertainty.** This paper explores the psychological significance of value-semantic resources as key determinants of quality of life in the context of global uncertainty. It argues that meaning and moral orientation serve as vital protective factors that help individuals maintain integrity, resilience, and purpose amid existential crises. Drawing upon existential and positive psychology, the study highlights how meaning-making processes buffer against depression and suicidal ideation, promoting emotional stability and psychological well-being. The authors emphasize the role of education and psychology in cultivating reflective awareness, empathy, and moral responsibility. The development of value-semantic resources is presented as a strategic direction for modern psychological practice, essential for sustaining human dignity and life's meaningfulness in an unstable world.

1.2. ***Mykola Didukh***. **Human Transcendental Therapy™ (HTT™): spirituality and humanism as factors of holistic personality development.** This paper introduces Human Transcendental Therapy™ (HTT™) as an integrative psychotherapeutic model that synthesizes contemporary psychological theory, neurobiological research, humanistic philosophy, transpersonal psychology, and spiritual self-exploration practices. HTT™ emerged as a response to the increasing prevalence of psychological fragmentation, identity diffusion, anxiety disorders, emotional burnout, and existential crises characteristic of modern society.

The contemporary psychological landscape increasingly demands therapeutic approaches that extend beyond symptom remission toward the restoration of inner coherence, the activation of spiritual potential, and the development of existential resilience. HTT™ offers a holistic pathway that addresses psychological suffering not as pathology alone but as a signal of disconnection from deeper existential structures of the personality.

HTT™ conceptualizes the individual as an integrated system comprising body, emotions, cognition, consciousness, and spirit, with therapeutic work aimed not merely at stabilization but at transcendence and evolutionary growth. This framework positions HTT™ as both a clinical methodology and a developmental paradigm.

1.3. ***Olena Tkachuk***. **The impact of sports activities on the development of anti-stress resilience and cognitive functions in students.** Sports activity is a key factor in the harmonious development of student youth, ensuring the formation of psychological resilience and improving cognitive functions in conditions of increasing psycho-emotional stress and information overload. Regular physical activity is recognized as an effective natural tool for supporting psychological and cognitive health. At the neurobiological level, sports activate neuroplasticity, improve blood circulation in the brain and stimulate the production of neurotrophic factors. This has a positive effect on executive functions, attention, memory, information

processing speed and the ability to think analytically. Sports activities optimize the functioning of the prefrontal cortex, improving skills such as planning and decision-making. From the point of view of stress resistance, physical activity reduces the level of stress hormones (cortisol) and increases the production of endorphins, which helps stabilize the psycho-emotional state and reduce anxiety. Sports form such important qualities as self-control, perseverance and responsibility. Studies confirm that athletes demonstrate higher levels of stress tolerance and cognitive performance compared to inactive peers. In addition, especially team sports, develop social skills, communication and the ability to interact. Thus, sports activities should be an integral part of the educational process for the formation of a successful, adaptive and stress-resistant personality.

1.4. ***Tadeusz Pokusa, Mykola Ohiienko, Filip Pokusa***. **Implementation of Artificial Intelligence (AI) in athletes' competitions based on selected examples.** Physical activity and sport are important factors in improving quality of life – both recreational and organized. Similarly, artificial intelligence is finding increasing applications in both professional and amateur sports. In the professional sphere, it is used, among other things, to analyze training data, predict performance and injury risk, and to analyze team games tactically. AI-based systems enable the development of personalized training plans tailored to the individual needs of athletes. This article discusses the issue of artificial intelligence in sports competition and its ethical dimensions.

1.5. ***Svitlana Danylchenko, Olga Tarasova, Olena Dolzhykova***. **Natural healing resources of Ukraine as a factor in improving the effectiveness of physical rehabilitation.** The article emphasizes the importance of natural factors in improving the effectiveness of physical rehabilitation. The potential of using climatotherapy, hydrotherapy, phytotherapy, and other natural resources that create Ukraine's unique therapeutic and rehabilitation capabilities is examined. It is shown that natural factors help normalize the body's functional systems, improve mental health, boost adaptive abilities, and raise patients' quality of life. The significance of including natural methods in comprehensive physical therapy programs is highlighted, aligning with current trends in personalized medicine and sustainable use of natural resources.

1.6. ***Liliia Kobylnik, Sabina Radzhabova, Snizhana Stepanova***. **Psychological features of anxiety correction in primary school children using art therapy.** The article addresses the problem of anxiety in primary school children as a relevant psychological and pedagogical phenomenon that complicates learning adaptation and social interaction. The study substantiates the feasibility of using art therapy as a humanistic and child-centered method of psychocorrection of anxiety manifestations. The paper presents the results of an empirical study aimed at identifying anxiety levels in primary school children and examining the effectiveness of an art-therapeutic program. The research sample consisted of third-grade students from a general secondary education institution. A set of psychodiagnostic tools was applied to ensure a multidimensional assessment of children's emotional states. The content and structure of the formative stage of the study, based on the use of various art therapy techniques, are described. The results of the control stage demonstrated a positive dynamic in anxiety levels following the corrective intervention. The findings confirm the effectiveness of art therapy as a means of psychological support for primary school children.

1.7. ***Dariusz Rogowicz*****. Uniform as a response – Youth facing the challenges of global concern.** In the era of late modernity, characterized by individualism and anti-authoritarian attitudes, the growing interest of young people in career paths within uniformed services constitutes a phenomenon replete with apparent contradictions. This article advances the thesis that this phenomenon does not represent a regression, but rather a complex psychosocial adaptation to the unique conditions of contemporaneity, referred to as "global anxiety." It is argued that the choice of a uniformed career functions as a defensive mechanism that enables the management of existential anxiety arising from a "polycrisis." This polycrisis constitutes a specific entanglement of threats associated with climate change, socio-political instability, economic precarity, and digital atomization. The analysis, based on a synthesis of Polish studies and an extensive review of international literature, demonstrates that the uniform becomes a tangible symbol and an institutional anchor that facilitates the restoration of a sense of order, identity, purpose, and agency. Terror Management Theory is adopted as the primary theoretical framework, as it explains how chronically heightened mortality salience motivates young people to seek heroic worldviews, embodied by the uniformed services.

1.8. ***Yevheniia Bazyka.*** **Quality of life characteristics of pre-retirement age women during military times.** This article examines the quality of life characteristics of Ukrainian women in late adulthood (ages 50-65) amidst the ongoing military conflict and social uncertainty. The research highlights that while this period is often viewed as a "triple crisis" involving professional, existential, and physiological challenges, recent scientific data suggests it is also a "golden age" where psychological functioning, strategic thinking, and emotional maturity reach their peak. Using an adapted quality of life questionnaire, the study analyses how different social statuses – working professionals, housewives, and the unemployed – impact subjective life satisfaction and the ability to manage stress during wartime.

The results of the empirical study demonstrate a significant correlation between professional employment and higher quality of life indicators. Employed women with continuous work experience showed the highest levels of satisfaction regarding personal achievements, social support, and optimism compared to housewives and unemployed women. Conversely, unemployed women exhibited the lowest levels of self-control and the highest levels of mental stress and negative emotions. The author concludes that professional self-actualization serves as a vital resource for overcoming life and work stress, effectively offsetting the psychological difficulties associated with aging during a period of war.

1.9. ***Zhanna Bogdan, Natalia Afanasieva, Tetyana Blyznyuk.*** **Assessment of the quality of professional life and resilience of women scientists in the conditions globalization.** The article explores the issue of professional quality of life and psychological resilience of women scientists in the context of global transformations. Resilience is presented as a dynamic resource that helps overcome professional stress, maintain emotional balance, and enhance well-being in the academic environment. The development of resilience is closely related to social support, self-efficacy, and participation in professional communities. The paper substantiates the need for comprehensive programs aimed at strengthening resilience through psychoeducational, mentoring, and reflective approaches. It is concluded that institutional support for mental health is a key factor in improving the quality of professional life and fostering the academic potential of women scientists.

1.10. ***Miroslav Gejdos, Ivan Ondrasik*. Ontological personalism and empirical functionalism: An analysis of bioethical models in the context of Catholic anthropology.** In a theoretical analysis, we analyze the current paradigmatic concepts in bioethics: ontological personalism and empirical functionalism, and their relation to the suffering human being. We critically analyze hedonism and utilitarianism, which are the theoretical bases for empirical functionalism. In particular, we offer arguments against the bioethical conception and understanding of a person as presented by Peter Singer. We conclude that man does not have bad human dignity even when he suffers and experiences pain. In line with ontological personalism, we hold the view of understanding the human person from conception to natural death, and we reject abortion and active euthanasia.

1.11. ***Iryna Astremska, Oleksandr Shtyrov.* Psychological aspects of studying the phenomenon "quality of life".** The article reveals the psychological aspects of the phenomenon of "quality of life". It is noted that the issue of quality of life attracts the attention of specialists from various fields, including sociology, psychology, economics, philosophy and medicine. Each of these aspects can contribute to a deeper understanding of the concept of quality of life and the development of targeted strategies for its improvement. The opinions of various scientists in the field of psychology on the definition of the concept of "quality of life" are presented.

It is shown that "quality of life" is a multi-component system that, in particular, takes into account the availability of social goods, services, social status, subjective well-being, psychological well-being, organization of life, all of which together play an important role in the psychological study of quality of life.

1.12. ***Tetiana Hauke.* Relationship between the level of psychological separation and emotional states of mature women.** The article examines the relationship between the level of psychological separation and emotional states in mature women. Theoretical foundations were derived from classical concepts of attachment, individuation, and differentiation of self, including the works of M. Mahler, J. Bowlby, M. Bowen, C. Rogers, and A. Maslow. An empirical study was conducted on a sample of 33 women aged 35 to 59 years. Psychological separation was assessed using the Psychological Separation Index, emotional states using the PANAS scale, and anxiety levels using the STAI method. The results showed that most respondents demonstrated high psychological separation, which correlated with higher levels of positive affect, lower negative affect, and lower reactive anxiety. Significant negative correlations between psychological separation and emotional tension, as well as positive correlations with emotional well-being, were identified. The findings confirm that completed psychological separation is an important factor in emotional stability and quality of life among mature women. The results may be applied in psychological counselling and support programs for women experiencing transitional life stages.

1.13. ***Olena Drozd, Bohdana Boichenko***. **The impact of adverse childhood experiences on the development of mental disorders in adulthood.** The article examines the psychological consequences of adverse childhood experiences and their long-term impact on the emotional and mental state of adults. The results confirmed a statistically significant relationship between the level of childhood trauma and the intensity of emotional and psychological symptoms in adulthood. Higher ACE scores correlated with increased levels of depression, anxiety, and somatic manifestations.

The developed psychocorrectional program demonstrated positive dynamics by reducing anxiety and depressive tendencies and improving emotional stability. The findings highlight the importance of early detection and psychological intervention for individuals with traumatic childhood experiences.

1.14. ***Oksana Melnyk, Liubov Vozna***. **Preventive strategies for population protection from emergencies: social aspect.** The article examines the social aspects of preventive strategies aimed at protecting the population from emergencies. The purpose of the study is to substantiate the need for a socially oriented approach to building a system for emergency prevention. The methodological basis includes systems analysis, the comparative method, and a sociological approach to studying population security issues. The results demonstrate that the effectiveness of preventive measures largely depends on considering the social determinants of vulnerability among different population groups. It is shown that socio-economic status, educational level, age, health condition, and access to information resources significantly influence individuals' ability to respond adequately to threats and protect themselves during emergencies.

A comprehensive set of preventive strategies is proposed, including informational and educational, socio-mobilizational, social protection, and institutional components. International experience in the socialization of civil protection systems is analyzed, and recommendations are provided for adapting best practices to the Ukrainian context.

1.15. ***Hanna Velichko***. **Personality vulnerability, its prevention and diagnosis.** The report highlights the importance of diagnosis and effective practical work to prevent victimisation. After summarising the existing information, it was established that there are diagnostic tools aimed at studying various aspects of victimisation of individuals, developed for subjects of different ages. The vast majority of questionnaires are in Russian or English. The relevance of victimisation prevention and prophylaxis is supported by researchers and practitioners working on victimisation issues. At the same time, today's tense, stressful situation in our society requires a separate response to challenges that have a powerful impact on people and taking them into account in practical work. The expediency of taking into account the personal context and individual work for the effective prevention of victimisation is emphasised.

1.16. ***Oksana Polianska, Igor Polianskyi, Olha Hulaha, Inna Moskaliuk***. **Using Artificial Intelligence in selecting physical loads.** Physical therapy is an important public health tool that should be used to maintain a certain state of health and rehabilitate patients, but therapeutic exercises are associated with a transient increase in the frequency of acute cardiac events in patients with cardiovascular diseases, which requires a special approach to selecting the intensity, duration, and frequency of physical activity. The use of artificial intelligence makes it possible to conduct early diagnostics of myocardial ischemia, select and control physical activity, which improves objective functional indicators and the psychological state of patients.

1.17. ***Liliya Dunets***. **EMDR therapy as a method of working with trauma that activates the natural healing mechanism.** This article examines Eye Movement Desensitization and Reprocessing (EMDR) as an evidence-based method for working with traumatic experiences by activating the natural adaptive information processing mechanism. The paper summarizes key theoretical principles of EMDR, reviews neurobiological research on bilateral stimulation, analyzes its effectiveness in treating post-traumatic stress disorder and complex trauma, and discusses specific aspects of its application in the context of the war in Ukraine. The article also compares EMDR with cognitive-behavioral therapy and highlights the advantages of EMDR for clients with severe traumatic exposure. Perspectives for further research and implementation of EMDR in Ukraine are outlined.

Chapter 2. Educational strategies, professional development and the role of technology in ensuring quality of life

2.1. ***Natalia Falko***. **Theoretical and methodological aspects of studying the readiness of psychology students for the implementation of rehabilitation measures.** This article presents a theoretical and methodological analysis of the readiness of psychology students to implement rehabilitation measures in contemporary socio-political conditions shaped by war, displacement, and widespread psychological trauma. The concept of psychological rehabilitation is examined as a multidimensional system aimed at restoring emotional stability, adaptive functioning, and resilience.

The structure of professional readiness is described through motivational-value, cognitive, emotional-regulatory, operational, and reflective-metacognitive components, drawing on the works of leading Ukrainian and international scholars. Special attention is given to the competencies required for trauma-informed practice, including crisis intervention, stabilization techniques, and multidisciplinary cooperation.

The article emphasizes the necessity of integrating theoretical knowledge, applied training, supervision, and personal development into educational programs preparing future psychologists for rehabilitation work. The findings highlight the critical role of professional training in ensuring effective psychological support for populations affected by traumatic experiences.

2.2. ***Iryna Ostopolets, Vadym Zavatskyi***. **Theoretical and methodological foundations of providing psychological assistance to families raising children with special needs.** The article provides a concise theoretical and methodological analysis of psychological assistance for families raising children with special educational needs. It highlights the psychological challenges these families face, including chronic stress, emotional exhaustion, and social isolation. The paper outlines key approaches to psychological support – competence-based, activity-oriented, systemic, person-centered, crisis-oriented, and resource-oriented. Essential professional competencies of psychologists are identified, such as empathy, emotional self-regulation, and effective interdisciplinary collaboration. Emphasis is placed on preparing future psychologists to work with such families and developing their counseling and emotional-regulatory skills. The article concludes that integrating diverse scientific approaches improves the quality of psychological support and promotes the psychological well-being of families.

2.3. ***Yulia Ilina, Yuliia Sidenko, Tetiana Mostova, Olena Doroganova***. **The relationship between meaning in life orientations and the leadership potential of future psychologists.** This article presents the findings of a comprehensive theoretical and empirical study examining key psychological determinants of the professional development of future psychologists in the context of contemporary societal challenges. The study emphasizes the importance of meaning-in-life orientations, personal growth initiative, self-actualization, and socio-communicative competencies as foundational components of leadership potential in psychology students. The empirical research involved 80 undergraduate psychology students and employed validated instruments, including the MLQ, PGIS-II, SSI, SAQ-SF, and MLQ-5X. The results demonstrated that the presence of meaning, intentional personal growth, and social skills positively correlate with transformational leadership indicators. Higher levels of self-actualization were associated with increased professional motivation and leadership activity. These findings highlight the necessity of integrating the development of personal and social resources into the system of professional psychological education to strengthen the leadership readiness of future practitioners.

2.4. ***Vladyslav Pyurko, Olga Pyurko, Liudmyla Arabadzhy-Tipenko***. **Interdisciplinary approach to ensuring and optimizing the quality of life in the modern world in the context of training specialists in medical-biology and natural sciences.** The article considers an interdisciplinary approach as a key factor in solving the problem of improving the quality of life in the conditions of global transformations of the modern world. The content and significance of knowledge integration in the training of future specialists in the medical, biological and natural sciences is analyzed. The need for the formation of complex competencies for an effective response to modern challenges related to health, ecology, biotechnology and social development is substantiated.

2.5. ***Iryna Hlazkova, Yuliia Nadolska, Larysa Yepifantseva***. **From crisis pedagogy to emotional resilience: sel in foreign language teaching.** The war in Ukraine and forced remote learning have created a "double challenge" for higher education. Emotional barriers, including anxiety, fear, and frustration, have become primary obstacles in foreign language learning. These barriers reduce motivation, concentration, and communicative activity, triggering cognitive, motivational, and organizational difficulties. Empirical research among university students confirms the dominant role of emotional factors under crisis conditions. Traditional teaching methods are insufficient to address these challenges effectively.

Social and Emotional Learning (SEL) techniques help manage stress, regulate emotions, and foster trust and engagement. In crisis remote education, it is essential for overcoming emotional barriers and supporting effective foreign language acquisition.

2.6. ***Oksana Kikinezhdi, Yaroslava Vasylkevych, Mykola Ryk***. **Development of adolescents' giftedness in the educational environment as a factor in improving the quality of life of the young generation.** The article presents the results of a study on the specifics of identifying and exhibiting different types of adolescent giftedness in the educational environment. The empirical study using rating assessments revealed that most participants demonstrate an average level of various forms of giftedness. A notable trend was observed: expert assessments of high levels of creative and motivational-personal giftedness significantly exceed both self- and peer assessments of these abilities. It is concluded that the homeroom teacher estimates students' creative potential significantly higher than the students themselves or their peers do. This may indicate students' underestimation of their possibilities or the limited conditions for manifesting such abilities within the school learning process.

2.7. ***Maryna Nesterenko, Kristina Petryk***. **Analysis of the current state of preparation of future teachers for STEM-oriented professional activities.** This study examines the current state of preparation of future teachers for STEM-oriented professional activities in Ukraine. Despite a robust regulatory and legal framework, integration of STEM components into teacher education programs remains fragmented and limited. The analysis of bachelor's and master's curricula across multiple pedagogical universities reveals that STEM is often represented by isolated courses or internships, with minimal cross-curricular integration. Bachelor's programs tend to offer stronger practical and interdisciplinary training, whereas master's programs prioritize methodological and research components, limiting hands-on STEM experience. Challenges include inadequate practical training, insufficient interdisciplinary links, and a narrow focus on digital literacy over broader STEM competencies. Emphasis is placed on the systematic integration of STEM education through a series of compulsory modules, project-based learning, and professional development for teachers. A coherent state and institutional policy is necessary to ensure that graduates are fully prepared to implement STEM-oriented pedagogy. The study provides insights into curriculum improvement and policy measures to foster a scientifically and technologically competent generation of educators.

2.8. ***Svitlana Nykyporets***. **Effects of English-mediated project work on soft-skills development and quality-of-life outcomes in early-career engineers: a mixed-methods evaluation.** Amid air-raid alerts and power cuts, early-career engineers in Ukraine must coordinate work in English while protecting well-being. This study tested an English-mediated project model using concise artefacts – role charters, risk registers, handover notes – plus pause-resume protocols across 54 triads. Compared with matched Ukrainian-language teams, soft-skill performance improved on a composite, with stronger gains in communication clarity and coordination, and a smaller but reliable effect in conflict resolution. Technical accuracy did not decline. Quality-of-life improved: career self-efficacy increased, perceived stress decreased, and WHO-5 rose. Cognitive load showed a small intrinsic increase but a larger extraneous decrease. Effects were assisted by documentation quality and strongest at B1-B2.

2.9. ***Wladyslaw Wornalkiewicz***. **Monitoring civic affairs.** Ongoing monitoring of civic affairs benefits not only the residents of a given area, administratively separated, for example, from the municipality, but also from officials employed in it. It is a bond between the citizen and the office. The citizen participates in the decision-making process in the part called the civic budget. Different types of IT tools are used in this regard, namely: Public In-formation Bulletin, Electronic Inbox, Municipal GeoPortal, broadcasts of municipal sessions. It is a kind of "looking at the hands of officials". It allows you to prevent all kinds of imperfections in the decision-making process, "engages" residents in participating in the selection and implementation of projects. The carried out survey, in an example of one of the municipalities of the Opole Voivodeship, made it possible to indicate recommendations to further improve the monitoring of civic affairs. It can be an inspiration for other municipalities to improve the rapprochement between citizens and local authorities.

2.10. ***Tetiana Tretyakova, Yelizaveta Rudenko***. **The role and place of education in improving the quality of life.** This paper explores the role of education as a key factor influencing the quality of life of an individual and society. The study highlights the multidimensional nature of quality of life and analyzes how educational processes affect personal development, social mobility, professional opportunities, and psychological well-being. Special attention is given to modern challenges faced by students, including anxiety, academic pressure, and the need for adaptation to rapidly changing educational environments. The research demonstrates that education not only provides knowledge and professional skills but also contributes to the formation of resilience, responsibility, and self-regulation. These qualities play a crucial role in building a stable, meaningful, and fulfilling life. Education is presented as a strategic resource that shapes human potential and supports sustainable social development.

2.11. ***Kateryna Zamkova, Volodymyr Shevchenko***. **The influence of parents psychological stability on the emotional state of children with special educational needs.** The article is devoted to the study of the relationship between the psychological stability of parents and the emotional state of children with special educational needs (SEN) in the context of inclusive education. The relevance of the topic is due to the growing role of inclusive education and the insufficient development of the issue of the influence of parental emotional state on the child. The work uses

a combination of theoretical and empirical methods: literature analysis, modelling, questionnaires, and psychodiagnostic tools (DASS-21, Rotter's RSK, Nemov's questionnaire, DDL methodology). The study was conducted on a sample of 13 mother-child pairs in an educational institution with inclusive support. The results showed a direct link between the emotional balance of parents, their stress resistance, and the adaptive abilities of children. The practical significance of the study for the development of psychological support programmes for families and improving the effectiveness of inclusive support is emphasised.

2.12. ***Natalya Pirogova.*** **Professional improvement of teachers in the minds of the war stand: emotional front and stability crisis.** This article is devoted to the study of professional burnout syndrome (PBS) among teachers in general education institutions in the context of full-scale war in Ukraine. Unlike in peacetime, when burnout is mainly associated with workload, the study focuses on the fact that the key factor in PBS today is chronic, highly pronounced anxiety and emotional exhaustion directly caused by the state of war. The goal is to quantitatively assess the level of burnout and anxiety, as well as to determine the structure of PWB in order to develop adequate intervention programs.

2.13. ***Olha Shevchenko.*** **Formation of the readiness of future physical education teachers to protect the health of schoolchildren using game technologies.** The article analyzes the preparation of future physical education teachers for the health preservation of students using game technologies. It was found that physical education teachers aim to form in students a stable motivation for a healthy lifestyle, which is possible only under the condition of a comprehensive combination of various methods and forms of health preservation activities in the educational process. It is proved that the game form of classes, which is created in lessons through the use of game techniques and situations, serves as a means of stimulation, motivation for educational activities and health preservation of schoolchildren.

2.14. ***Viktoriia Anishchenko, Liudmyla Olefir, Iryna Ievreinova.*** **The role of informal education in shaping the life trajectory of future teenagers who are in custody.** Non-formal education is a flexible, practice-oriented form of learning based on the principles of learning by doing, cooperation, and self-directed learning. It is an innovative form of education for adolescents placed in custody, and its implementation supports the development of metacognitive skills, emotional competence, and social responsibility among residents of penitentiary institutions. Special attention is given to personalizing the educational process, integrating knowledge with real-life contexts, and creating a safe learning environment. In penitentiary institutions, non-formal education performs corrective and resocialization functions, helping adolescents transform their thinking and behavior. The educational cycle includes taking responsibility, emotional reflection, action implementation, and evaluation of outcomes. Forms of learning include trainings, workshops, online courses, and social projects. This approach opens the way to self-realization, the development of life skills, and the construction of a positive future trajectory for adolescents, supporting their reintegration into society.

2.15. ***Mykola Blyzniuk, Oleksiy Debre, Yaroslav Radko.*** **Digital competence of a modern teacher and its impact on improving the quality of life.** This article explores the role of digital competence as a key element of modern teachers' professional readiness and examines how it contributes to improving their overall quality of life. Digital competence is defined as a multidimensional construct that includes technical skills, information literacy, digital communication, collaboration, and responsible online behavior. The study shows that teachers with higher levels of digital competence are better equipped to apply innovative teaching methods, organize flexible and personalized learning, and maintain effective communication within the educational community.

The findings highlight that the integration of digital technologies into teaching practices helps reduce routine workload, increase efficiency, support emotional well-being, and enhance confidence in professional activities. Digital competence also opens new opportunities for continuous development through online courses, professional networks, and participation in international projects.

The article concludes that strengthening digital competence should be a priority of teacher training systems and professional development programs. Future research may focus on the relationship between digital skills, job satisfaction, and teachers' psychological well-being.

2.16. ***Nataliia Muranova, Dmytro Volhushyn, Mykhailo Hadalin*****. Educational strategies for implementing professional development and quality of life for managers and specialists in the IT field.** The article presents the results of a theoretical analysis of the relationship between professional development and quality of life of managers and specialists in the IT sphere in the context of the digital transformation of society. The methodological basis is an interdisciplinary approach that combines the results of andragogical, psychological and pedagogical research. It analyses current trends in the development of formal, non-formal and informal education as means of increasing the competitiveness and professional development of IT workers. It has been proven that the introduction of educational innovations ensures a harmonious combination of professional growth with the preservation of psychological well-being, which directly affects the quality of life. The results of the study confirm that professional development is a key factor in social progress and improving the quality of life in the digital age.

2.17. ***Myroslav Bekchyv.*** **The impact of Artificial Intelligence on the career guidance processes of modern youth: new challenges and prospects for interaction.** The article explores the integration of artificial intelligence (AI) technologies into the teaching of higher mathematics as a key component of contemporary digital transformation in education. Generative AI systems such as ChatGPT, Copilot, and Wolfram Alpha are analyzed as cognitive partners that enhance personalization, adaptive learning, feedback mechanisms, and reflective thinking. The study outlines new didactic opportunities based on the principles of adaptability, authenticity, and reflexivity while identifying pedagogical and ethical challenges related to academic integrity, algorithmic transparency, and data privacy. An original concept of AI integration into mathematics education is proposed, combining three interconnected directions: the formation of students' digital and ethical competence, the development of AI pedagogical literacy among teachers, and the integration of AI tools into

educational platforms (Moodle, Google Classroom). The implementation of this model promotes the emergence of a new pedagogical paradigm – generative pedagogy – in which the teacher becomes a facilitator, the student a co-creator of knowledge, and technology a means of enhancing human intellectual potential.

2.18. ***Vladyslav Herasymenko.*** **Integration of Artificial Intelligence into the teaching of higher mathematics: new didactic opportunities and pedagogical challenges.** Artificial intelligence is a challenge for humanity. It will take a long time for us to fully assess its impact on various aspects and spheres of human life. During the period when young people form their life values and orientations, choose professions, and strengthen their worldview, they are accompanied by artificial intelligence at every step. This study focuses on the influence of artificial intelligence on the quality of young people's lives and its role in supporting their professional identity.

2.19. ***Anton Serdiuchenko, Kateryna Petrovska.*** **Digital education of social workers as a factor in improving the quality of life of vulnerable population groups.** In the context of global transformations, technological progress, and wartime challenges in Ukraine, the modernization of the social sector is becoming increasingly urgent. Vulnerable populations – internally displaced persons, military families, the elderly, people with disabilities, and orphans – require accessible and high-quality social services. This article argues that the digital education of social workers is a key mechanism for improving these services. It enhances professionals' ability to apply modern technologies, manage online platforms, and ensure continuity of support. The authors highlight national and international academic perspectives and outline how the development of digital competencies among social work professionals directly impacts the quality of life of vulnerable groups. The article concludes with recommendations for integrating digital tools into social work education to meet the demands of a rapidly digitalizing society.

Chapter 3. Socioeconomic, environmental and management aspects of quality of life

3.1. ***Esmira Ahmadova Mirmammad, Tetyana Nestorenko, Lala Hamidova.*** **The impact of human capital development on living standards: evidence from European countries.** This study examines the impact of human capital development on living standards across European countries using a multidimensional panel dataset covering the period 2017-2024. Human capital is conceptualized through three core components – education, digital skills, and health capital – reflecting both traditional and modern determinants of socio-economic well-being. Employing fixed-effects models, Driscoll-Kraay corrected estimators, and two-step System GMM, the analysis provides robust empirical evidence that human capital development significantly improves both material and subjective dimensions of living standards. Digital skills emerge as the most influential factor, strongly associated with higher income levels, improved employment outcomes, and greater life satisfaction. Health capital and

tertiary education also demonstrate substantial positive effects. The study further shows that labour market structures partially mediate the relationship, while institutional quality acts as a moderating factor that amplifies the returns to human capital. Overall, the findings highlight the need for integrated policy strategies that combine investments in education, digital competencies, health systems, and institutional governance to enhance living standards and reduce regional disparities across Europe.

3.2. ***Olena Chukurna, Yelyzaveta Chukurna.*** **Research on consumer loyalty in the residential construction market.** The article considers and analyzes the current state of the housing construction and real estate market in the Odesa region. The factors influencing the formation of the housing construction market are identified. The dynamics of price changes in the residential real estate market and the criteria put forward by the consumer for the purchase of residential real estate are analyzed. A study of consumer loyalty in the residential real estate market is conducted, a cluster and dispersion analysis of consumer loyalty is carried out. Factors influencing consumer behavior in terms of incentives for the purchase of residential real estate are identified. Recommendations are developed for the formation of demand in the residential real estate and housing construction market.

3.3. ***Zlata Kafarska.*** **Assertiveness in business.** The article highlights the problem of assertiveness in the context of the specifics of entrepreneurial activity. It is noted that the main qualities of assertiveness are self-esteem and a conscious assessment of one's own value. The features and specific functions of entrepreneurial activity are identified, which comprehensively affect various areas of an entrepreneur's activity and determine the need to develop assertive skills as a prerequisite for the successful achievement of professional goals. It is indicated that these features also have a negative impact on the development of an entrepreneur's assertive skills. It is determined that the model of assertive business behavior is formed at the intersection of values, communication, emotional maturity, behavioral strategies and organizational culture. The importance of using special techniques for the formation of a high level of psychological, managerial and communicative competencies is emphasized.

3.4. ***Marek Janicki.*** **Income and expenditure of local government units responsible for maintaining and improving the standard of living of residents in the Opole Voivodeship compared to the country in the years 2015-2024 – indicator approach.** This article presents the revenues and expenditures of local government units (LGUs) responsible for maintaining and improving the standard of living of residents in municipalities and cities with county rights in the Opole Voivodeship. The study utilizes eight indicators that enable the presentation of multidimensional relationships between the financial condition of municipalities and cities with county rights and the standard of living of residents in the Opole region from 2015 to 2024. The obtained information is presented against the backdrop of Poland. The study utilizes data available in the Local Data Bank (as of October 2, 2025). The presented indicators utilize information collected in accordance with the principles set forth in the Public Finance Act, i.e., division into sections and chapters defining the type of activity and paragraphs defining the type of income or expenditure. The data presented by sections, chapters, and paragraphs are prepared in accordance with the detailed classification of income and expenditure established by the Minister of Finance.

3.5. ***Alina Yakymchuk, Małgorzata Skulimowska***. **Biodiversity as a renewable energy resource: estimating ecosystem productivity for sustainable development.** Biodiversity forms a fundamental basis for renewable energy production by sustaining ecosystem productivity and regulating biogeochemical cycles. This article explores biodiversity as a renewable energy resource, with particular emphasis on estimating ecosystem productivity – especially net primary productivity (NPP) – within the broader framework of sustainable development. Drawing on a synthesis of scientific literature and global data on forest, grassland, wetland, and agricultural ecosystems, the study investigates how ecosystem services contribute to energy security. The analysis shows that biodiversity-driven ecosystems maintain energy flows through biomass production, regulate carbon cycles, and strengthen ecological resilience. Methodological approaches such as remote sensing, ecological modelling, and economic valuation are examined to assess energy productivity. The findings highlight the significant potential of biodiverse ecosystems to support renewable energy systems, while also acknowledging the trade-offs between energy extraction and conservation. The paper concludes with policy recommendations for integrating biodiversity-based energy services into sustainable development strategies.

3.6. ***Tetiana Zaiats, Oksana Diakonenko, Olena Sova.*** **Cohesion trends in territorial communities: wartime and post-war regularities for quality of life improvement.** The article reveals the patterns of social cohesion within the territorial communities of Ukraine. General and specific regularities of cohesion are identified, among which the most significant are the voluntary nature of unification based on equality and respect for rights, the sharing of common interests, and mutual trust. It is established that social and economic inequality, segregation, institutional distrust, and pro-Russian propaganda have a negative impact on cohesion, while historical and cultural commonality, territorial proximity, similarity of socio-economic living conditions, and the activities of civic and volunteer organizations contribute positively.

3.7. ***Svitlana Bykova.*** **Success as a psychological descriptor of the quality of an individual's social life.** From a psychological point of view, personal success is an important indicator of the quality of a person's social life, a descriptor that contains relevant information about a person's achievements; structures information about their social life and personality expression in it; describes personal success in terms of its connection with other psychological characteristics; enables predictions to be made both about the manifestation of an individual's success and about the probable quality of their social life, etc. Therefore, the generalisation of information about psychological markers of success and the characteristics of a successful individual are parameters by which the quality of their life can be judged.

3.8. ***Olha Kertsman.*** **The role of social media in spreading narratives of sleep culture as an important tool for improving quality of life.** The article presents a theoretical and analytical study of the role of social networks in spreading narratives of sleep culture as a socio-psychological tool for improving quality of life. Based on an interdisciplinary analysis of sources from neuropsychology, stress psychology, social psychology, and digital communications, it has been determined that humanistic and educational media content contributes to the normalization of attitudes toward rest, the reduction of emotional tension, and the formation of healthy behavioral patterns.

It has been found that social networks serve as a medium for disseminating evidence-based knowledge about sleep through mechanisms of affiliation, emotional empathy, and algorithmic reinforcement.

3.9. ***Mariia Kravchenko.*** **The influence of nonverbal communication on the formation and development of romantic relationships: a study of heterosexual couples.** The article examines the psychological mechanisms through which nonverbal communication influences the processes of forming and further developing romantic relationships in heterosexual couples. Nonverbal exchange is considered a multidimensional phenomenon encompassing gestures, facial expressions, posture, tactile interactions, spatial behavior, and eye contact, all of which play a crucial role in conveying emotions, intentions, and attitudes between partners. It is substantiated that the effectiveness of nonverbal interaction depends on the partners' ability to adequately encode and decode nonverbal signals, which serves as a prerequisite for the formation of emotional closeness, trust, and a sense of security. Nonverbal behavior is understood as an integral component of interpersonal attraction that shapes first impressions and the subsequent dynamics of interaction.

3.10. ***Tetyana Siroshtan, Zoya Mytyay, Iryna Gapeeva.*** **Language ecology as a guarantee of quality of life in a globalized world.** The growth of the communicative power of the Ukrainian language necessitates the need to adhere to the principles of language ecology, which involves the imitation of language norms, the justified use of emotionally colored vocabulary (as well as slang, dialect and other words), giving preference to native Ukrainian (as opposed to borrowed) vocabulary, as well as increasing the efficiency of communicative interaction between speakers, which constitutes a direct basis for strengthening Ukrainian identity and building our state, and accordingly creates favorable conditions for improving the quality of human life in the modern globalized world.

3.11. ***Liudmyla Shlieina, Tetiana Ivanets.*** **Methodology of teaching gender-neutral and inclusive speech in the professional training of future specialists.** The article theoretically substantiates and develops a methodology for teaching gender-neutral and inclusive speech in the professional training of future specialists. The relevance of the study is due to the need to form inclusive communication competence (ICC) in graduates, which, unlike general communicative ability, includes a mandatory social and ethical dimension. The developed structural and content model of the methodology is based on a competency-based approach and is implemented in three stages: theoretical-cognitive, practical-operational and evaluative-reflective. It is proven that the effectiveness of training is ensured by the principles of integration (cross-curricular teaching in professional disciplines), contextualization (use of professionally oriented cases) and dialogicity / reflection. The main tools are active interactive methods (case studies, language training, debates). Key pedagogical conditions for the successful implementation of the methodology have been identified, in particular, the staff readiness of teachers and the provision of resources with industry-specific non-discriminatory dictionaries. Criteria for assessing the formation of the ICC have been established.

3.12. ***Tetiana Tretyakova, Taisia Leventhal.*** **The connection of the communicative process in the globalized world with information stress.** The article investigates the relationship between globalized communicative processes and the phenomenon of information stress in the digital age. The psychological consequences of excessive information load arising from multichannel communication, constant media contact and algorithmic dynamics of digital platforms are considered. Modern Ukrainian and international studies have been analyzed, which confirm the impact of information overload on the cognitive and emotional spheres of a person. The author outlines the concept of "communication and information stress" and defines it as a psycho-emotional state caused by the excess of information flows. Particular attention is paid to the concept of information hygiene as a tool for reducing stress and maintaining psychological stability. Practical ways of self-regulation are proposed – digital detox, critical thinking, control of online activity time. The work is of practical importance for the development of media literacy and mental health in the context of the information war.

3.13. ***Marianna Pavlyshyn.*** **The economic instruments of agriculture as a factor in improving the quality of life of Ukrainians.** The publication presents the results of research into the role and significance of economic instruments in Ukraine's agro-industrial complex in ensuring socio-economic stability and improving the quality of life of the population. An analysis of the concepts of "economic instruments" and "quality of life of the population" in the context of the agrarian economy has been carried out. The structure and main types of economic instruments used in Ukraine's agribusiness sector are identified, in particular, state support mechanisms, tax incentives, credit and financial levers, as well as rural development programs, etc. The main problems and shortcomings in the application of economic mechanisms have been identified, including the inefficiency of budgetary support, uneven access to resources and a lack of innovative technologies. Areas for improving the effectiveness of economic instruments are proposed, including the development of cooperation, digitalization of the industry, stimulation of organic production, and improvement of the state regulation system. The results of the study are aimed at improving the social welfare of Ukrainians and strengthening the country's food security.

3.14. ***Maryna Zelinska, Anastasiia Sorokina.*** **Risk management standards in infrastructure investment projects: international experience.** Risk Management (RM) in infrastructure investment projects, especially in the construction industry, is gaining strategic importance amid global economic instability and the need for network restoration. The article aims for a comprehensive analysis of leading international RM standards: ISO 31000:2018, WB/IFC requirements (ESG), FIDIC contractual mechanisms, and EU financial regulations (Solvency II). Theoretical foundations and practical case studies (the "Ice Arena, " Fehmarnbelt Fixed Link) are analyzed. It is established that international standards are critically necessary for transparency, effective allocation of responsibility, and the attraction of institutional investments. Recommendations are proposed for harmonizing domestic RM practices in construction with international requirements.

3.15. ***Leonid Pankovets.*** **The impact of Artificial Intelligence technologies on the formation of business models in the digital economy.** The article examines the impact of artificial intelligence technologies on the formation of business models in the digital economy and the directions of implementing innovative approaches to doing business. Practical cases and examples of global companies that successfully integrate artificial intelligence technologies into their business models are considered, depending on the direction of their use and innovation goals. Practical cases of implementing artificial intelligence in the sphere of activity of companies such as Amazon, Google and Netflix are considered. The main directions of business model transformation in the digital economy are substantiated. A classification of business models of the digital economy is proposed and substantiated depending on the application of artificial intelligence technologies, as well as their use in specific examples.

3.16. ***Andrii Tymchyshyn, Kateryna Tymchyshyn.*** **Formation of environmentally conscious legal culture as a component of improving the quality of life in the context of globalization.** The article explores the conceptual foundations of forming an environmentally conscious legal culture as a key component of improving the quality of life in the context of globalization. It is substantiated that the modern paradigm of social development requires the integration of environmental values into the legal consciousness of citizens, since only a balanced combination of legal knowledge, moral responsibility, and ecological thinking ensures the sustainability of social systems and the well-being of future generations. It is emphasized that legal culture cannot remain isolated from environmental challenges, because it is through law that society establishes mechanisms for environmental protection, rational use of natural resources, and the guarantee of human ecological safety.

The study shows that globalization, despite its positive effects of knowledge and technology exchange, simultaneously exacerbates ecological problems and creates new risks for quality of life related to environmental degradation and social inequality. In this context, the formation of environmentally oriented legal awareness becomes a priority within the education system, particularly in legal education, where future professionals should realize their role as agents of change toward sustainable development.

The article highlights the need for the humanization of legal education, the introduction of interdisciplinary courses on environmental law, bioethics, environmental psychology, and sustainable development. It is noted that the cultivation of an environmentally conscious legal culture is possible only through the synthesis of scientific knowledge, ethical principles, and civic engagement. Practical directions are proposed for improving educational policy aimed at training specialists capable of making decisions that combine legal feasibility, environmental responsibility, and social justice.

It is concluded that the formation of an environmentally conscious legal culture is a strategic condition for improving the quality of life, as it contributes to personal development, harmonization of human-nature relations, and strengthening the principles of sustainable development in society.

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