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FROM CRITICAL THINKING – TO CREATIVITY: STEPS TO UNDERSTANDING

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The paper contributes to the study of correlation between critical and creative thinking as the twenty-first century skills vital to succeed and stay competitive in the modern Information Age. The aim of the research is to ground a possibility of facilitating creativity with the help of critical thinking. The concepts of creative thinking and critical thinking are analysed. A synergetic correlation of creativity and critical thinking, with mutual reinforcement of both, is argued. Critical thinking is getting more innovative character, while creativity is raising to a higher level with more realistic results. To investigate the mechanism of reaching a creative result through critical thinking, original Bloom's taxonomy of educational objectives and learning behaviours was compared with its revised version of 2001. It was highlighted that both versions of the taxonomy presuppose that critical thinking skills complement and reliably enable the creation of innovative ideas and new realities. The revised version recognizes and emphasises the creativeness of the critical thinking and, vice versa, the necessity of critical judgments in creating new products. The relevance of critical thinking skills for the development of creativity was considered with the help of an integrative model of critical and creative thinking proposed by L. Combs, K. Cennamo, and P. Newbill. It illustrates that critical and creative thinking overlap when it goes about the generation and refinement of ideas – at the level of high-order thinking processes, according to B. Bloom's taxonomy. The article argues that collaboration of critical and creative thinking starts even earlier – namely, at the stage of setting a target for innovation, collecting information, interpreting and applying it – and continues throughout the entire path of constructing an innovative idea, its reflective evaluation and practical implementation. That is, critical thinking ensures self-regulation of creative thinking at all stages of creative activity and serves as a methodological tool of the creative process. It is concluded that application of critical thinking to creativity leads to better-grounded decisions, unbiased attitudes, more innovative solutions and higher quality deliverables.

Keywords: *critical thinking, creative thinking, synergetic effect, facilitation, methodological tool.*

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ВІД КРИТИЧНОГО МИСЛЕННЯ – ДО КРЕАТИВНОСТІ: КРОКИ ДО РОЗУМІННЯ

О. Є. Місечко, Т. В. Литньова

Стаття присвячена вивченню співвідношення між критичним і креативним мисленням як уміннями двадцять першого століття, життєво важливими для досягнення успіху та збереження конкурентоспроможності в умовах сучасної інформаційної епохи. Мета дослідження – обґрунтувати можливість сприяння креативності за допомогою критичного мислення. Проаналізовано поняття креативного та критичного мислення. Аргументується синергетичний зв'язок креативності та критичного мислення із взаємним підсиленням обох, при цьому критичне мислення набуває більш інноваційного характеру, тоді як креативність піднімається на вищий рівень з більш реалістичними результатами. Щоб дослідити механізм досягнення творчого результату через критичне мислення, оригінальну таксономію освітніх цілей і поведінки у навчанні Б. Блума було порівняно з її переглянутою версією 2001 року. Було підкреслено, що обидві версії таксономії передбачають, що вміння критичного мислення доповнюють і надійно уможливлюють створення інноваційних ідей і нових реалій. Переглянута версія демонструє креативність критичного мислення і, навпаки, необхідність критичних суджень у створенні нових продуктів. Актуальність умінь критичного мислення для розвитку креативності розглядалася за допомогою інтегративної моделі критичного та креативного мислення, запропонованої Л. Комбсом, К. Сеннамо та П. Ньюбіллом, яка ілюструє, що критичне та креативне мислення перетинаються, коли йдеться про генерацію та уточнення ідей – на рівні процесів мислення вищого порядку, згідно з таксономією Б. Блума. У статті стверджується, що співпраця критичного та креативного мислення починається ще раніше, а саме на етапі встановлення цілі для інновацій, збору інформації, її інтерпретації та застосування, і продовжується протягом усього шляху побудови інноваційної ідеї, її рефлексивної оцінки та практичної реалізації. Тобто критичне мислення забезпечує саморегуляцію творчого мислення на всіх етапах творчої діяльності та виступає методологічним інструментом творчого процесу. Зроблено висновок, що застосування критичного мислення до творчості веде до більш обґрунтованих рішень, неупередженого ставлення, більш інноваційних рішень і вищої якості результатів.

Ключові слова: *критичне мислення, креативне мислення, синергетичний ефект, фасилітація, методологічний інструмент.*

Introduction of the issue. Yet at the end of the 1960s, an American psychologist K. Rogers, when developing the idea of the humanistic approach towards an educational process, asserted that such qualities, as independence and creativity would most successfully develop in such educational settings in which self-directed learning and self-evaluation is encouraged [17]. Ability of self-assessment, thinking over the produced actions, their positive and negative consequences, reasons of certain consequences, methods of increasing effectiveness of the next activity is considered in a scientific environment as a capacity for the critical thinking. Thus, a connection between creativity and critical thinking skills has become a subject for scientific study.

Contemporary list of the twenty-first century skills vital to succeed and stay competitive in the modern Information Age proves the topicality of this connection, with critical thinking and creativity ranking high on the list. The necessity to foster the development of education in the light of tomorrow's needs prompts various internationally recognized organizations to offer guidance on relevant basic knowledge, skills and attitudes. In 2001, a Partnership for 21st Century Skills national organization was founded in the U.S. to help prepare secondary education level students for Common Core State Standards and Career Readiness Standards to insure that all of them possess knowledge and skills they needed to be successful in the twenty-

first century environment and global citizenship. Accordingly, a P21 Framework was developed with input from teachers, education experts, and business leaders to define and illustrate a set of key academic subjects and skills [12]. Among them, a group of learning and innovation skills (also called Four Cs) was singled, such as critical thinking, communication, collaboration and creativity. At the end of 2006, the European Parliament adopted a European Framework for Key Competences for Lifelong Learning that was used as a key document for the development of competence-based education, teaching and learning. The revision and further specification of these competences in 2018 states that "skills, such as problem solving, critical thinking, ability to cooperate, creativity, computational thinking, self-regulation are more essential than ever before in our quickly changing society" [6]. Moreover, both skills of critical thinking and creativity are included in the group of those that are embedded throughout all eight key competences (literacy competence; multilingual competence; mathematical competence and competence in science, technology and engineering; digital competence; personal, social and learning to learn competence; citizenship competence; entrepreneurship competence; cultural awareness and expression competence). They overlap and intertwine, can be applied in many different contexts and are essential for personal fulfillment and development, employability and social inclusion, sustainable and healthy lifestyle, successful social life and active citizenship in a life-long learning perspective. Critical thinking and creativity skills are included in the list of so-called 'soft skills' that employers seek in the candidates they hire, because they relate to work efficiency and are important for almost every job.

In view of all the above, there are enough reasons to make these skills the subject of a special targeted scientific study.

State-of-the-art. In the western science, where the problem of creativity in education began to be developed considerably earlier (the Ukrainian term *"креативність"* and its derivatives, as known, were borrowed from English), the concept of creativity was formed under the influence of various cognitive theories. As J. Piirto and many other researchers emphasize, modern interest in creativity as a measurable phenomenon and many of the creativity skills currently taught are based on a theory of divergent thinking initiated in 1950 by an American psychologist J.P. Guilford. He identified original factors that made up divergent production: "sensitivity to problems, ideational fluency, flexibility of set, ideational novelty, synthesizing ability, analyzing ability, reorganizing or redefining ability, span of ideational structure, and evaluating ability" [15: 2]. Treffinger, Isaksen, and Firestein (1983), when developing the model of creative teaching, considered the influence of both cognitive and affective factors on each level of this model and suggested corresponding techniques of influence, the sequence of which displays the increase of problem-solving operations on the way to receive new knowledge. Houtz & Krug (1995) interpreted thinking as a process of constructing knowledge; i. e. emphasized creative character of thinking. The well-known test for measuring creativity by E. Torrance (Torrance Test of Creative Thinking, TTCT, 1958) has received international recognition after a number of improvements.

Much research has been done on the study of sub-processes involved in creative thinking. Some scholars have proposed creative process models that organize these sub-processes (Osborn-Parnes Creative Problem Solving Model, 1963, 1981; Mumford, Mobley, Uhlman, Reiter-Palmon, and Doares,1991; Finke, Ward, and Smith, 1992; Treffinger, 1995). Nowadays, scientists and educators are focusing on a set of recommendations for training creativity skills as a primary source of innovation, growth, adaptability, and psychological

resilience.

In publications of Ukrainian researchers (O. Dubasenyuk, V. Moliako, Ya. Ponomariov, S. Sysojeva), focus of the thinking process on the achievement of new results is generally perceived in the context of creativity as a special attitude toward doing certain actions that is accompanied by overcoming traditional stereotypes of thinking, intellectual activity, independent choice of method of action, readiness for problem-solving and innovations, development of internal plan of actions, necessity of self-realization and self-improvement. In the "Encyclopedia of Education" (2008), the interpretation of the concept of creativity emphasizes the "creative spirit", "creative potential" of an individual, interest and heightened sensitivity to everything complex and unusual, openness to new experiences, the skill to recognize the problematic in the trivial, autonomy of views and evaluations, independence from stereotypes, openness to different ideas, ability to wonder and admire [8: 432]. On this scientific background, the introduction of the term "creative thinking" is caused by a necessity to emphasize one's mental capacity for divergence and unexpectedness of decisions.

Creativity in educational process has been studied in the context of different groups of learners, various academic subjects and teaching tools. The methodological basis of developing creativity in professional training is substantially demonstrated in the works of Yu. Chernenko, N. Fesenko, N. Guziy, N. Kichuk, M. Lazarev, V. Lozova, O. Pyekhota, N. Ruban, V. Semenyuk, V. Timanyuk, and others. The formation of different types of creativity in the individual is studied by O. Dunaeva, V. Fritsyuk, O. Kutsevol, L. Sushchenko.

O. Dubasenyuk offers a conceptual theory of formation and development of creative thinking in would-be-teacher's education, which involves a certain sequence of stages for mastering the necessary pedagogical tools of creative activity. First of all, future teachers should learn the appropriate techniques of creativity and their application in practical activities; later, students master the means of creativity, and then, with the acquisition of experience, certain strategies of creative activity are acquired (through systems of professionally oriented tasks and personally determined actions, combinatorial actions at various stages of solving a creative task) [7]. V. Lunyachek formulates as one of the tasks of higher professional education the need to help future specialists become "generators of ideas" in the directions of their professional development [11]. Some researchers substantiate the expediency of introducing creativity into the list of leading competencies in the process of training a future specialist [18].

It is necessary to note that in the Ukrainian scientific discourse, two overlapping terms – "tvorchist" and "kreatyvnist" – coexist and are discussed. A number of scientists interpret "tvorchist" as a concept synonymous with "kreatyvnist", while others differentiate them. Some researchers define "kreatyvnist" as an ability to construct something new, and "tvorchist" – as a process and a result of human activity. There is also an opinion that the Ukrainian terms "kreatyvnist" and "tvorchist" correspond as the English terms "creativity" and "creativeness" [20: 33]. According to such differentiation, the phenomenon of "kreatyvnist" is described then as an inward capacity for variability, flexibility, and innovation of thinking activity, which precedes the process of "tvorchist" as an outward result-centered action [20]. Although in traditional English usage, the difference between the words "creativity" and "creativeness" appears to be somewhat different: creativity is defined as an ability to use imagination to produce a novel idea or product that is useful to society, i.e. as an outward activity; while creativeness characterizes the state of being creative, i.e. an inward quality [19]. There is also an opposite opinion that "tvorchist" is a more general concept, an

umbrella term for "kreatyvnist", which refers to such innovative activity that not only puts forward ideas, but also brings them to a specific practical result. Another misunderstanding arises when the concept of "creative learning technologies" is replaced by the concept of "interactive learning technologies", which happens quite often, as V. Lunyachek admits, although these tearms cannot be perceived as a complete analogy [11: 114].

Thereby, it is possible to conclude that the concept of creativity is still in the process of its identification and specification in the Ukrainian pedagogical discourse. Nevertheless, it has become an active methodological instrument and, among scientific approaches, an independent creative approach to the study of pedagogical activity has stood out.

The term "critical thinking" has its roots in the early 20th century. It was introduced by John Dewey in 1910 as the name of an educational goal identified with a scientific attitude of mind [9]. Since that time, the scientific world has generated dozens of definitions of the term. A recognized authority in the domain of critical thinking, former Director of Research and Professional Development Departament at the Center for Critical Thinking (the USA), R. Paul defined critical thinking as "the intellectually disciplined process of actively and skilfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action" [14]. He means self-directed thinking that illustrates the refinement of thought according to a specific mode or domain of thought. In his opinion, critical thinking also includes an assessment of the thinking process itself – the course of thought that leads to these conclusions or those factors that we take into account when making a decision: "Critical thinking is thinking about thinking when you think in order to improve your thinking" [14]. He also says that it is "a mode of thinking – about any subject, content, or problem – in which the thinker improves the quality of his or her thinking by skilfully taking charge of the structures inherent in thinking and imposing intellectual standards upon them" [13]. Both statements emphasize the dynamic nature of critical thinking, its ability to be modified and improved, to discover new opportunities in the process of its use.

M. Lipman, another prominent figure in the critical thinking research domain, has appealed for a special "community of inquiry approach" as the only fully appropriate pedagogy for the teaching of critical thinking [10]. He called the last decade of the twentieth century "one of a gathering of momentum by the critical thinking movement" to highlight the importance of introducing critical thinking skills into the school education.

As a result of an upsurge of attention to the development of critical thinking skills in the last decades of the previous century, educational institutions and departments of education around the world began to include critical thinking as an educational objective in their curricula guidelines for school subjects. In response to huge topicality, the European Commission has funded "Critical Thinking across the European Higher Education Curricula", a nine-country research project to develop guidelines for quality in critical thinking instruction in European institutions of higher education, on the basis of the researchers' findings of the critical thinking skills and dispositions that employers expect of recent graduates [9]. Contemporary range of world research on various aspects of critical thinking is countless and highly detailed.

Publications of Ukrainian scientists in the field of critical thinking development mostly concern professional training at the tertiary educational level (O. Belkina-Kovalchuk, L. Kienko-Romanyuk, T. Khachumyan, O. Kolesova, V. Konarzhevska, O. Tiaglo, T. Voropai, etc.). In the course of framing school educational programmes, they spread to the levels of primary and secondary

school (K. Bachanov, O. Belkina-Kovalchuk, O. Marchenko, O. Pometun, S. Terno, etc.). For example, O. Pometun has suggested the didactic definition of critical thinking as a separate type of thinking, which is characterized by activity, purposefulness, independence, discipline and reflexivity and involves the development in the process of learning such personal abilities as to identify problems, analyse, synthesize, evaluate information from any sources, put forward alternatives and evaluate them, to choose a way to solve a problem or one's own position regarding it and justify one's views, make a conscious choice and act [16: 94]. In recent years, recommendations for the development of critical thinking have appeared, offering lesson plans, exercise systems, and teaching methods.

However, the problematic field of the development of critical and creative thinking still has enough unfilled gaps that require in-depth study. In particular, this article is aimed at highlighting the problem of the coherence of critical and creative thinking.

Aim of the research is to investigate the connection between critical and creative thinking and a possibility of facilitating creativity with the help of critical thinking.

Methods of research. To achieve the aim, the study uses a set of research methods: method of theoretical analysis of pedagogical ideas; method of structural and functional analysis of the key concepts (critical and creative thinking); methods of synthesis, induction, and deduction – to investigate correlation of these two ways of thinking; qualitative analysis, alternative analysis, and comparative analysis – to prove that both ways of thinking enrich each other.

Results and discussion. In fact, many researchers agree that creative and critical thinking are two different cognitive processes that need different approaches in the educational environment. Creative thinking means that you can come up with new ways to make sense of and interpret the world around you to bring into existence something innovative, i.e. creativity serves as a prerequisite to innovation [15]. Critical thinking is often described as "thinking about thinking", which means that you can understand the way your perception works in order to build a logical chain of arguments, identify flaws in your reasoning, avoid biases, compare variants and choose the best one. Critical thinking is usually associated with analysis and highly logically framed judgemental outcomes, while creative thinking tends to break out old frameworks and synthesize something new. Critical thinker uses evidence in support of arguments, while creativity deals with images. Critical thinking is determinately rational, while when using creative thinking, learners come up with new ideas as a result of intuition and irrationality.

Further investigation of the mental actions that shape the processes of critical thinking and creativity reveals that critical thinking overlaps with creative thinking. Both ways of thinking are directed on tasks that demand high-level thinking skills, tend to working out one's own judgments, not consuming other people's thoughts and ideas, need constant evaluation of results and consider alternatives. Both are not tied by stereotypes and standards, develop the ability to think outside of the box and disrupt habitual patterns of thinking. Learners who use both methods of thinking become more sophisticated, confident, and autonomous.

The arithmetic conjugation of these two ways of thinking results in a complex multi-operational purposeful process, in which, if you want to get an original innovative idea, you must think critically. However, more important is a synergetic correlation of creativity and critical thinking, with mutual reinforcement of both.

Still in 1993, R. Paul argued that creative dimension of thinking is best fostered by joining it with the critical thinking dimension [14]. A decade later, M. Lipman noted with regret that

different dimensions of thinking (critical and creative thinking including) had not been integrated efficiently enough for educational purposes, and critical thinking "came to be seen as a disconnected, discontinuous fragment, shouldered with responsibility for upgrading the whole of education" [10: 5-6]. A similar point of view on the necessity to unite efforts of critical and creative thinking is presented by O. Tiaglo when he writes that "critical thinking is in a relationship of mutual complementarity with "creative thinking", or creativity", and they both naturally supplement each other [21]. In support of the idea of combining the two skills, L. Combs, K. Cennamo and P. Newbill suggested a conceptual model of creative and critical thinking [5]. They recognize critical thinking as a process of analysis, synthesis, and evaluation of ideas that involves generation of ideas, their reflective judgement and selection. The last three mental operations form a common basis for both critical and creative thinking.

The synergetic effect of the co-operation of critical and creative thinking is possible when you constantly analyse and evaluate your thinking process, look for a non-standard viewpoint, combine seemingly incompatible, identify the novelty of your reasoning, doubt and analyse the reasons for your doubts, experiment and realistically evaluate the results of experiments, compare your idea with existing ones and strive to find new ways. In other words, in the course of synergetic reciprocal action, critical thinking gets more innovative character, while creativity raises to a higher level with more realistic results. We fully agree with Sh. Bailin who claims that critical thinking plays "a crucial role" in innovation [3], since the very first steps of the creative process, such as recognition of the urgency of novelty, identification of the changes needed, search of ways to get the required result, involve critical assessment, as well as constant comparison and judgment. Besides, innovation must be evaluated critically in terms of its novelty and value. As D. Hitchcock points out, "creativity in any field needs to be balanced by critical appraisal" [9]. That is, thorough reasoning, analysis of cause-and-effect relations, evaluation of pros and cons, critical thinking provides creativity with solid grounding. Creativity, thus, can result in faster decisions and more innovative solutions. On the other hand, critical thinking is the best way to innovation as it lets us to consider things from a fresh perspective and different angles, to identify new ways of doing things and process ideas better, so that we can challenge and refine them later to get higher quality of the final product.

The question arises then: what is the mechanism of critical and creative thinking co-operation? To answer the question, we would relate to the renowned book of B. Bloom in which he classified learning behaviours in the cognitive domain. Efforts of B. Bloom and his colleagues to analyse the process of thinking resulted in the taxonomy of educational objectives and learning behaviours as a practice-oriented handbook of constructive suggestions (1956). The author of this widely accepted taxonomy was driven by the necessity to clearly identify and classify a range of possible educational goals and outcomes for teachers, administrators, professional specialists, and researchers who dealt with curricular design and students' educational process evaluation problems [4]. That is why he was very strict and precise in the definition of descriptive terms being used and the measurement of educational objectives, so that there would not appear any misunderstandings and misinterpretations.

Although the very term "critical thinking" was not used in the final version of the taxonomy, the letter incorporated many important critical thinking abilities. The condensed version of the taxonomy contained: 1) knowledge (of specifics, terminology, facts, ways and means of dealing with specifics, conventions, trends and sequences, classifications and categories, criteria,

methodology, universals and abstractions in a field, principles and generalizations, theories and structures; 2) comprehension (translation, interpretation, extrapolation); 3) application (the use of abstractions in particular and concrete situations); 4) analysis (of elements, relationships, organizational principles); 5) synthesis (production of a unique communication, a proposed set of operations, development of a set of abstract relations); 6) evaluation (judgements in terms of internal evidence and external criteria) [4: 201-207].

The taxonomy's top level (or, as they are called by B. Bloom, "higher-order") thinking skills of analysis, synthesis, and evaluation characterise the learner as a person able to check the consistency of hypothesis with given facts and assumptions; to formulate hypothesis based upon an analysis of factors involved or to modify them in the light of new factors and considerations; to recognize explicit and implicit arrangement of a structure; to connect elements and parts so as to form a whole that did not previously clearly exist; to make discoveries and generalizations; to compare and judge the value of things and ideas for given purposes. All these abilities are viewed as critical thinking abilities. Meanwhile, all of them add some necessary steps to the process of creating a new product.

In 2001, Anderson and other scholars revised Bloom's taxonomy into a two-dimensional framework of knowledge and cognitive processes to make it more modern and convenient for educators to use [2]. The revised version includes two commonly used nowadays terms "problem-solving" and "critical thinking". And what is especially important – it puts the category "creation" at the top of the hierarchy. "To create" as a cognitive process is described as to "put elements together to form a coherent or functional whole; reorganize elements into a new pattern or structure". It also includes such subcategories as "generating/hypothesizing", "planning/designing", and "producing/constructing". The educational objective of creation stands instead of the previous category "synthesis" and changes place with "evaluation", following it (see Figure 1). Evaluation of a problem/ situation/ argument as an element of critical thinking when choosing a path of investigation and a possible solution as a creative task leads to finding the best feasible answers.

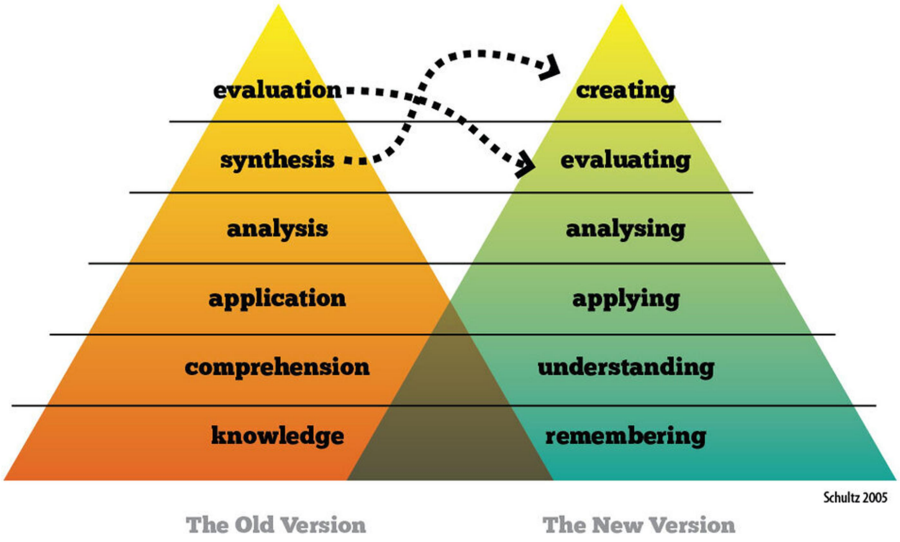

Fig. 1. Bloom's Taxonomy Revised [1]

Thus, it is obvious that both versions of the taxonomy presuppose that critical thinking skills complement and reliably enable the creation of innovative ideas

and new realities. The revised version recognizes and emphasises the creativeness of the critical thinking and, vice versa, the necessity of critical judgments in creating new products. In-depth understanding of this convinces us in the significance of critical thinking for the creative power of a thinker.

In order to make sure of the relevance of critical thinking skills for the development of creativity, it is worth considering an integrative model of critical and creative thinking proposed by L. Combs, K. Cennamo, and P. Newbill [5]. The model illustrates that critical and creative thinking overlap when it goes about the generation and refinement of ideas – at the level of high-order thinking processes, according to B. Bloom's taxonomy. In this article, we argue that collaboration of critical and creative thinking starts even earlier – namely, at the stage of setting a target for innovation, collecting information, interpreting and applying it. The process of formulating a goal, taking into consideration previously acquired knowledge and new information and turning it into a new idea that can be applied to a new situation or problem is exactly what begins with critical thinking and ends with a creative output. Each of these operations needs skills that refer to the domain of critical thinking: asking questions, formulating a concept, comparing, selecting, making relevant choice, evaluating information. That is, critical thinking ensures self-regulation of all processes at this stage of creative activity.

When new ideas are generated, they need reflective judgement. This stage, again, involves critical analysis, which helps the thinker to develop the ideas, and occurs through actions that include clarifying assumptions, separating information into relevant and irrelevant components, and identifying connections to determine how these components relate to each other, building a logical chain. Once relationships are determined, thinkers work to synthesize the components in order to formulate the final version of the idea. The use of critical thinking on this stage enables thinkers to support and justify the results of their synthesis of information and increases the validity of their thoughts and ideas.

The final critical evaluation of innovative ideas proceeds through judgments about the resources on which the final conclusions are based, as well as the logic, practical value, and viability of the ideas created.

In the educational process, if we want learners to be more effective in processing information, innovative in generating ideas, and productive in applying them creatively, it is necessary to recompense creative imagination with critical assessment, to encourage learners to analyse the situation in details and view it from a different angle, to step out of the traditional frame of thinking. When constructing a new idea in a learning environment, critical thinking facilitates the generation of ideas that are truly unique and novel, and helps evaluate them in such a way that the goals are achieved using best methods.

Thus, it is possible to say that critical thinking serves as a methodological tool of the creative process and accompanies it all the way from the formulation of an innovative idea to its implementation. Application of critical thinking to creativity leads to better-grounded decisions, more innovative solutions and higher quality deliverables.

Conclusions and research perspectives. What our society needs most today are people with flexible minds and high cognitive abilities who can adapt to changes, envision new opportunities, and create innovative solutions for tomorrow. Among the abilities needed to be successful and competitive in the twenty-first century, critical thinking and creativity rank top-high.

On the one hand, creative and critical thinking seem to be of opposite nature: creative thinking is very intuitive, even irrational, breaking out of established patterns, based on curiosity and inspiration, with unpredictable

outcomes; while critical thinking is very rational, intellectually disciplined and planned, following established cause-and-effect patterns, based on arguments, and concentrated on a final target.

On the other hand, when the process of critical thinking is applied to the process of collecting and interpreting information for innovative ideas, constructing and evaluating them, then it coincides with creativity and leads to more reliable and justified innovations.

When used together, creativity and critical thinking can benefit and enrich each other and produce a synergetic effect. Critical thinking over a problem results in faster and better-grounded decisions, unbiased attitudes, more creative and innovative solutions. Creation based on procedures of critical thinking is more authentic and original.

If we prioritise such cognitive abilities as questioning, conceptualizing, analyzing, synthesizing, generating ideas, figuring things out, evaluating, then we should build the creative process on the grounds of critical thinking, and use it as a methodological instrument of creativity.

Further development of this approach can be viewed in the direction of discussing and researching the efficiency of various critical thinking operations for the promotion of creativity.

REFERENCES (TRANSLATED & TRANSLITERATED)

1. *A Teacher's Guide to Bloom's Taxonomy.* Retrieved from: https://www.innovativeteachingideas.com/blog/a-teachers-guide-to-blooms-taxonomy [in English].

2. Anderson, Lorin W., Krathwohl, David R., Airiasian, Peter W., Cruikshank, Kathleen A., Mayer, Richard E., Pintrich, Paul R., Raths, James, & Wittrock, Merlin C. (2001). *A Taxonomy for Learning, Teaching and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives*. New York: Longman, complete edition. Retrieved from: https://www.uky.edu/~rsand1/china2018/texts/Anderson-Krathwohl%20-%20A%20taxonomy%20for%20learning%20teaching%20and%20assessing.pdf [in English].

3. Bailin, Sharon. (1987). Critical and Creative Thinking. *Informal Logic*, 9(1), 23-30. Retrieved from: doi https://doi.org/10.22329/il.v9i1.2656 [in English].

4. Bloom, B.S. (1956). *Taxonomy of educational objectives, handbook I: The cognitive domain.* New York: David McKay Co Inc. [in English].

5. Combs, L.B., Cennamo, K.S, & Newbill, P.L. (2009). Developing Critical and Creative Thinkers: Toward a Conceptual Model of Creative and Critical Thinking Processes. *Educational Technology*, 49 (5), 3-14 [in English].

6. Council Recommendation of 22 May 2018 on key competences for lifelong learning. *Official Journal of the European Union*. 4.6.2018, 1-13. Retrieved from: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018H0604(01)&from=LT [in English].

7. Dubasenyuk, O.A. (2011). Kreatyvnyy pidkhid do profesiyno-pedahohichnoyi pidhotovky maybutnikh uchyteliv [Creative approach to professional and pedagogical training of future teachers]. *Kreatyvna pedahohika – Creative pedagogic*, vyp. 4, 23-28. Retrieved from: https://core.ac.uk/download/42970427.pdf [in Ukrainian].

8. *Entsyklopediya osvity [Encyclopedia of Education]* (2008). Kyiv: Yurinkom Inter [in Ukrainian].

9. Hitchcock, David. (2020). Critical Thinking. *The Stanford Encyclopedia of Philosophy* (Fall 2020 Edition), Edward N. Zalta (ed.), Retrieved from: https://plato.stanford.edu/archives/fall2020/entries/critical-thinking/ [in English].

10. Lipman, M. (2003). *Thinking in Education.* 2-nd ed. Cambridge: Cambridge University Press [in English].

11. Luniachek, Vadym. (2018). Formuvannya kreatyvnoho myslennya studentiv u protsesi profesiynoho navchannya [Formation of creative thinking of students in the

process of professional training]. *Problemy inzhenerno-pedahohichnoyi osvity – Problems of engineering and pedagogical education*, № 61, 112-120. Retrieved from: https://doi.org/10.32820/2074-8922-2018-61-112-120 [in Ukrainian].

12. P21 Framework Definitions (2009). *The Partnership for 21st Century Skills.* Retrieved from: https://files.eric.ed.gov/fulltext/ED519462.pdf [in English].

13. Paul, R. & Elder, L. (2001). *Tools for Taking Charge of Your Learning and Your Life.* Prentice Hall, Upper Saddle River, NJ [in English].

14. Paul, Richard W. (1993). The Logic of Creative and Critical Thinking. *American Behavioral Scientist*, 37(1), 21-39. Retrieved from: doi:10.1177/0002764293037001004 [in English].

15. Piirto, J. (2011). Creativity for 21st century skills. In *Creativity for 21st Century Skills*. Sense Publishers, 1-12 [in English].

16. Pometun, O.I. (2018). Krytychne myslennya yak pedahohichnyy fenomen [Critical thinking as a pedagogical phenomenon]. *Ukrayins'kyy pedahohichnyy zhurnal – Ukrainian pedagogical journal*, № 2, 89-98. Retrieved from: http://nbuv.gov.ua/UJRN/ukrpj_2018_2_14 [in Ukrainian].

17. Rogers, Carl R. (1969). *Freedom to Learn.* Columbus, Ohio: Charles E. Merill Publishing Company. Retrieved from: https://archive.org/details/freedomtolearn00roge/mode/2up [in English].

18. Semenenko, I.Ye. (2018). Formuvannya kreatyvnoyi kompetentnosti u protsesi profesiynoyi pidhotovky studentiv [Formation of creative competence in the process of professional training of students]. *Pedahohika ta psykholohiya – Pedagogy and psychology,* 59, 221-229. Retrieved from: http://doi.org/10.5281/zenodo.1228350 [in Ukrainian].

19. *The difference between Creativeness and Creativity.* Retrieved from: https://diffsense.com/diff/creativeness/creativity [in English].

20. Tkachenko, L.I. (2014). Kreatyvnist′ i tvorchist′: suchasnyy content [Creativity and creativeness: modern content]. *Osvita ta rozvytok obdarovanoyi osobystosti – Education and development of a gifted personality,* № 9-10 (28-29), 32-35 [in Ukrainian].

21. Tyahlo, O. (2017). Chy potribne krytychne myslennya ukrayins′kiy shkoli? [Does Ukrainian school need critical thinking?]. *Praktychna mediahramotnist′: mizhnarodnyy dosvid ta ukrayins'ki perspektyvy – Practical media literacy: international experience and ukraininan perspectives:* zb. st. p'yatoyi mizhnar. nauk.-metod. konf. z mediaosvity ta mediahramotnosti (m. Kyyiv, 31 berez. – 1 kvit. 2017 r). Kyyiv: Tsentr Vil′noyi Presy, Akademiya ukrayins′koyi presy, 60-64. Retrieved from: http://dspace.univd.edu.ua/xmlui/handle/123456789/5569 [in Ukrainian].

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