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Research paper



Safety Textbooks that Implement a Personality-Oriented Approach

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Abstract

The present article considers a conceptual approach to the creation of a coursebook that would implement the so-called ternary matrix, which will allow a student to effectively gain and build up knowledge. The authors illustrate how such ternary matrix can realize three-coordinate model of modern education, which consists of three interconnected processes: the subject knowledge transfer, socialization of the student and his/her cultural education. By means of the coursebook traditional descriptive text transformation into a performative text and textbook division into four blocks authors create the cognitive environment in which there is a synergistic strengthening of three interrelated information flows – learning, socialization and cultural education. As a result a student-centered approach to learning and increased efficiency of learning is achieved.

Keywords: *study block; information blocks; information flow; performative text; personality-oriented approach, ternary matrix of knowledge.*

1. Introduction

Nowadays the ever-developing educational system is characterized by rethinking the role and place of the teacher in the educational process, as well as by changing the motives, norms, goals, forms, methods and means of teaching. It tends to teaching reorientation from authoritarian, with a central person of the teacher as the only information medium (characteristic for an industrial society with its classroom teaching system), to student-oriented one (characteristic for the information society). At the same time, there is a change in the learning means, due to the powerful processes deployment for the processing and broadcasting of information characteristic for a new era.

It is precisely this volume of multilevel and varied information masses that is peculiar to teaching a university course on some disciplines of the security cycle, for example, "Life Protection" (European name "Human security" or "Occupational Safety and Health") and "Civil Protection". Based on the humanities, natural sciences, engineering, human sciences and sociology, discipline "Life Protection", for example, contains information that does not allow to systematically present it in a textbook in the traditional descriptive form. Therefore, information blocks of well-known textbooks often do not have a clear logical structure, verbal text control tools for managing the information perception and understanding process. The materials of the "Life Safety" textbooks are mostly "monologous": to impress with the erudition authors try to place in the limited number of pages as many references from different branches of knowledge as possible. Such approach makes coursebooks too difficult for understanding, "formal" and boring. Thus, the main principle of modern education – a personality-oriented approach to a student – is violated.

2. Main body

2.1 Analysis of recent research and publications

The characteristic feature of modern society, especially of its youth, is the rejection of large amounts of textual information. According to Maklien, "...society, being at the present stage of development, is transformed into an "e-society"... and with the help of electronic means of communication creates multidimensional perception of the world. The development of electronic communication media returns human thinking to the pretextual era, and the linear sequence of signs ceases to be the basis of culture" [1]. Information society is characterized by the so-called clip art culture (according to E. Toffler's terminology), which is "based on endless flickering of the information segments and is comfortable for people of the corresponding mentality" [2]. The main features of clip culture are mosaics, the image fragmentation, its brightness, high speeds, rapid change in images; similarity, disparity, fragmentation of data, dissolution of its holistic models.

The research basis of the educational information presentation problem in the modern textbook is the concept of information epistemology by A. I. Rakitov, the philosophy of culture by M. S. Kagan, the dialectics of the cultural processes by V. A. Konev, the linguistic studies of the text by Hatim and Mason, Jurij Lotman, and also research on information pedagogy by V.A. Smirnov. The authors have also taken into account the problem of modern youth clip thinking, which significantly impedes the holistic perception of data, its analysis and generalization.

Using a coursebook in the teaching process is a specific form of communicative-cognitive activity, which includes cognitive manipulation of text information, symbolic communication between a

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teacher and a student through a printed media, aimed at perception and understanding of the text. In this case, effective teaching and learning always include three interdependent and interrelated components: subject learning, socialization and cultural education. In point of fact, we have three interconnected processes of student's informational exchange with the surrounding environment, informational and educational space [3].

Analysis of the well-known university textbooks on the Life Safety written by O.I. Zaporozhets, E.P. Zhelibo, V.V. Zatsarny, I.P. Pistun, V.V. Berezutsky and others testifies that these authors present educational materials as information blocks formed on the descriptive text basis. In this way, the authors construct the textbook using unary knowledge matrix [4], which provides only monofunctional learning, which is ineffective. In these textbooks, the authors attempt to implement the system-logical (linear) presentation method, when the material is presented sequentially, according to the logical connection of its elements: either from concrete facts to their generalization (inductive flow of presentation), or by formulating general theses and confirming them by facts and examples (deductive flow of presentation). However, the unary matrix is only useful for describing or recognizing rules. Binary matrices are useful to form an active practice. But if we aim to develop skills and competencies that will allow building new skills and competences (the so-called rules of cognitive design) on the basis of the previous ones, then it is necessary to create ternary matrices. It is the ternary knowledge matrix that allows us to realize the three-dimensional model of modern learning (subject teaching, socialization and cultural education) [3], lay the foundation of the domination in teaching of axiological cultural forms and forms-principles (according to V.A. Konev), contributing to the formation of security culture, implement personality-oriented approach in the Life Protection studies.

2.2 Formulating the article goals

The philosophical basis of innovative Life Protection coursebook was the creation of a ternary matrix by introducing the student to three information flows: the subject teaching, socialization and culture education. For this purpose, through the transformation of the traditional descriptive text the authors aim to create a cognitive environment, in which there would be a synergistic strengthening of all three information flows. And such strengthening is possible only if there is a coherence of the necessary information flow in space and time. The practical realization of this task is to form such thematic information blocks on Life Protection, which would be multicomponent, multilevel, scientific, and, apart from the presentation of subject knowledge, would enforce social values and ideological orientations as components of the respective competencies. Expected results are seen by the authors in increasing effectiveness of learning through the formation and development of personality traits, aimed at ensuring student's own safety, environmental safety, safety of society and state, growing confidence in the need for protective measures, formation of physical and psychological strength.

2.3 The main material presentation

The core of organizing effective delivery of educational information in the modern textbook is the text manipulation. To date, there is no single understanding of the very "text" concept, but the most famous are the followingnes:

1) a text is any object that can be "read", whether this object is a work of literature, a street sign, an arrangement of buildings on a city block, or styles of clothing. It is a coherent set of signs that transmits some kind of informative message [5].

2) "[Text is] a set of mutually relevant communicative functions, structured in such a way as to achieve an overall rhetorical purpose" (Hatim and Mason, 1990) [6].

Personality-oriented learning requires a change of the descriptive text onto a performative text [7]. According to Austin the performative text is an utterance that is equivalent to action, or it is a statement, pronunciation of which performs action. This means that when a person pronounces a performative utterance, he or she does not just speak, but does something, changes the situation, social reality. Describing performative utterance, John Austin noted: "A. they (performative sentences) do not 'describe' or 'report' or constate anything at all, are not 'true or false'; and B. the uttering of the sentence is, or is a part of, the doing of an action, which again would not normally be described as saying something" [7, p.5]. The grammatical form of these utterances requires the first person active verb in the present tense. Although later Austin noted that any statement of Homo agens (active human) has an active nature. Habermas has adopted the principle of performativity from a separate utterance to the whole text.

Therefore, educational performative text is the text that is able to perform an action. Such text not only contains some message, but also demonstrates what is being said, accompanies theoretical provisions with their implementation, thereby confirming the validity of what has been said. Moreover, performativity is considered as the author's self-presentation in communication, "self-interested self-presentation" (Y.Habermas) [8].

The text means performativity radical changes not only in the form of text and communication, but also in the thinking way of the person who is learning: the position of the student as an "outside observer" is changing to the active learner position. The student is now situated inside the constructed by the teacher situation, taking part in it by the very fact of his thinking about it. The performative text is the result of the author's awareness of the situation, facts, etc. [9] and it has the form of rules and regulations.

Rakitov mentions that ternary knowledge matrix requires presenting information in the coursebook in the form of rules and regulations. "The difference between them is that the rules contain at least one variable and for this domain (of knowledge – auth.) are universal standards of activity. The prescriptions, on the contrary, do not contain variables; they only make sense in relation to some particular situation. Moreover, rules and regulations unlike conditional statements, contain certain modalities: "It is necessary to do ...", "You should ...", "You must ...", or imperative sentences: "Press ...", "Divide ...", "Take notice", "Pay attention" "Fill in the gaps", etc. "[4]. Reading through such text, the student unconsciously turns on the mechanisms of understanding, and this is just what is necessary for an effective learning. Student's thinking becomes open, dialogical, he gets involved into the cognition process, as well as in the social, general scientific and cultural contexts outlined. The text performativity allows for structuring the information, making it multicomponent, while simultaneously comparing the various spheres of social experience – popularization and history of science, applied natural sciences, engineering and humanities, social values, world-view orientations [10]. However, according to Rakitov, "the realization of knowledge as ternary matrices is possible only in a certain cognitive environment, which contains one or another logic that provides a formal or meaningful transition from one knowledge to another, moreover it must be such a transition, which, by the time, can be carried out without reference to observations and experiments, and hence without the use of additional data"[4]. In our study, we are examining primarily a traditional paper-based textbook that remains the most popular amongst other source materials.

The educational information in such coursebook is structured and presented in the form of information study blocks (ISB). (The information study block – the constituent of the text [11] – is a certain amount of data, indivisible within the declared topic and described with one or more elements of information having a single semantic load. Elements of the information include texts, drawings, diagrams, tables, formulas). Each of the created information study blocks is a system consisting of four subsystem blocks: the basic study block (BSB), the complementary study block (CSB), the signal study block (SSB) and the applied study

block (ASB). Worth noticing, that the CSB, the SSB and the ASB must be inserted in the BSB on the principle of "four in one". The basic study block is formed from separate statements of the written text, which are sequentially numbered and placed in the text according to the logical order of their teaching, providing "the transition from one knowledge to another". The complementary study block consists of didactic materials concerning worldview and popular science, which expand, complement, popularize, and affect the emotional and sensory sphere of the student, thus disrupting the mechanism of information perception. CSB is written in the form of descriptive text and graphically distinguished from the performative text of the BSB by the subheading called "You may like it", "Interesting fact", "Non multa, sed multum," etc. Signal study block consists of performative statements (rules and regulations) that contain especially important and worth paying special attention to or remembering information. The SSB is separated from the performative text of the BSB by didactic note such as "Noteworthy!", "Pay attention!" or "Remember!" etc. The applied study block provides an example of solving a specific real-life problem or task concerning safety topics. It is separated from the main text by the subheading "Example", "Practice", etc. The unit or chapter of the textbook may also contain a diagnostic block (DB), in which tests or other assignments are submitted to verify the level of knowledge acquisition and the formation of the respective competencies. The authors have a positive experience of supplementing the DB with the QR-code, which allows each student to work in his own online office, to keep track and correct his own results. The number of CSB's SSB's and ASB's, their size, correlation and their alternation sequence (the transition from one type of knowledge to other, according to Rakitov) may be different, and determined by the teaching material logic and didactic expediency.

Fig. 1 demonstrates principal scheme of the information study block (ISB), which consists of the basic study block, corresponding to the academic discipline curriculum. BSB is presented in the form of a performative text (2), which has a form of numbered statements alternating with complementary (CSB), signaling (SSB) and applied (ASB) study blocks.

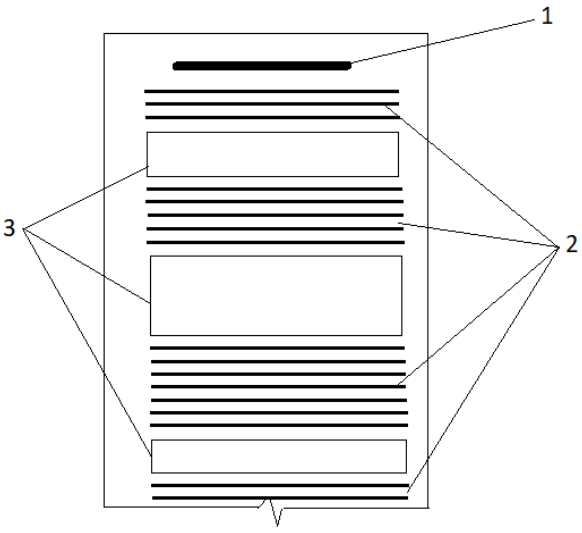


Fig. 1: Principal scheme of the information study block **(ISB).**

1 – Topic title;
2 – Performative text of the basic study block (BSB);
3 – Complementary (CSS), signal (SSB) or applied (ASB) study blocks.

Since the performative text is characterized by densified and multi-vector information presentation, for the convenience of the study material perception in the basic and signal study blocks the keywords and phrases are highlighted, for example, with blue color (as in web links). The pages may also contain the QR-code. The highlighted words may be used as hyperlinks**,** so the student can broaden his knowledge by referring to relevant sources, which are easy to find on the Internet while self-learning. Such an approach allows the student to get access to large arrays of additional textual information, which due to its diversity and significant amount cannot be comprised and logically structured in a textbook. In such way a principle of multi-vector thinking is realized, the student's orientation towards independence in search for information, which is one of the modern education main requirements is ensured.

Thus, without increasing the textbook contents, the subject matter of the course is expanded through the references to external sources, containing related knowledge. This encourages the student's involvement in a wider information environment, stimulates self-learning. Direct the student's stimulation to independent information search is carried out, mainly, through the complementary study block, where the scientific popularization of educational material takes place; or through the diagnostic block, which adds another distinguishing feature to the textbook – creativity. Consequently, the information study block (ILB) has the form of multi-level, branched hypertext, structural units of which are linked by a single thematic plan, which is increasing the effectiveness of learning through a person-oriented approach.

As an example, let's look at the content of the information study block (ISB) for the program theme "Human Biorhythms".

2.4. Information study block "Human Biorhythms"

1. As well as any other biological processes, mental processes, mental conditions and mental properties of a person, vary depending on time. The course of biological processes in time is studied by a chronobiology, a science which arose in the XXth century.
2. A separate part of chronobiology is biorhythmology, a science that studies biorhythms, that is, the laws of periodic (cyclic) changes in the intensity and nature of biological processes and phenomena.

Pay attention! Cyclicity (repeatability) is a property of not only ani[illegible] it[illegible]timate matter. The day cha[illegible] time of the year comes i[illegible]er the location on the sky of the celestial bodies is naturally repeating in time and so on**.**

SSB1

3. Biorhythms are natural processes and phenomena of wildlife, which are repeated in time.
4. Some biorhythms are relatively independent (for example, heart contractions or respiratory movements), others are related to the adaptation of living organisms to geophysical cycles: 1) daily (for example, fluctuations in the intensity of cell division, metabolism, motor activity of animals), 2) tidal (for example, biological processes in organisms caused by recurrence of marine tides and outflows); 3) annuall (for example, change in the number of populations and animal activity, growth and development of plants), etc.
5. According to their frequency (period), biorhythms are classified into high-frequency biorhythms (short-period), medium-frequency biorhythms (with intermediate-length periods), and low-frequency biorhythms (with large values of periods).
6. High-frequency biorhythms have periods ranging from a fraction of a second to 30 minutes. Such rhythms include: heart contractions, respiratory movements, biorhythms of the brain, fluctuations of the internal organs (liver, spleen, etc.), intestinal peristalsis, and others.
7. Medium-frequency biorhythms have periods that vary from 30 minutes up to 7 days. Such rhythms include alternation of sleep and being awake, changes in working capacity, functions of internal organs (liver, kidneys, etc.), ability to memorize information, and others.

Pay attention! Medium-frequency biorhythms, are subdivided into ultradiant (with periods from 30 minutes to 20 hours), circadian (with periods from 20 to 28 hours) and infradaynym (with periods from 28 to 36 hours). The term "circadian" means “close to daily” (from the Latin words circa - about, near and dies - day).

8. Most low-frequency biorhythms have periods from 7 days to 2 years. These include emotional activity, physical activity, intellectual activity, hair density, and others.

REMEMBER! The [illegible] a person belongs to circadian biorhythms, has a period close to the daily one.

9. In every 24 hours there are four main periods of time during which the human efficiency is the highest: from 5:00 to 6:00, from 10:00 to 12:00, from 16:00 to 18:00, from the 24th to the 1 a.m.
10. German chronobiologist Till Roenneberg, has classified people into three groups with relation to the patterns of their circadian rhythms: people with morning biorhythmic type of work efficiency (larks), people with arrhythmic type of work (pigeons) and people with evening biorhythmic type of work efficiency (owls).
11. People with a morning biorhythmic type of work efficiency experience the highest working capacity earlier than it is mentioned above for around 1-1.5 hours.
12. People with an evening biorhythmic type of work efficiency experience the highest working capacity later than it is mentioned above for around 1-1.5 hours.
13. Affiliation with a certain biorhythmic type of work efficiency can be determined empirically (using standard psychological tests, for example, the Ostberg test, psychophysiological studies or observational results).
14. Belonging to a certain biorhythmic type of work efficiency can be established by a physiological experiment based on the calculation of the ratio between the frequency of respiratory movements ν_{resp} and the frequency of cardiac contractions ν_{card}. If the result of division (ν_{card} / ν_{resp}) fits into the interval of values 4,5 ± 0,5, a person should be classified as a person with arrhythmic type of work efficiency.
15. If the result of division (ν_{card} / ν_{resp}) fits into the interval of values 6±1, a person should be classified as a person with morning biorhythmic type of work efficiency.
16. If the result of division (ν_{card} / ν_{resp}) fits into the interval of values 3±1, a person should be classified as a person with evening biorhythmic type of work efficiency.

EXAMPLE 1. A study person takes 15 breaths (and, accordingly, 15 exhalations) per 1 min., and his/her pulse (that is, the number of cardiac contractions) is 72 beats per minute. What kind of biorhythmic type of work efficiency does this person belongs to?

SOLUTIONS

1. The heart rate of the subject person is equals:

$$\nu_{heart} = \frac{72}{60\ s} = 1,2\ Hz$$

2. The frequency of [illegible] of the person equals:

$$\nu_{resp} = \frac{15}{60\ s} = 0,25 Hz .$$

3. The desired co[illegible] frequencies equals:

$$\frac{\nu_{resp}}{\nu_{heart}} = \frac{1,2Hz}{0,25Hz} = 4,8 .$$

4. The resulting value belongs to the numerical interval **4,0 ≤ (ν_{heart} / ν_{resp}) ≤ 5,0**.

CONCLUSION: The study person belongs to type with arrhythmic type of disability. His/her highest working capacity is observed at such intervals of the day: from 5:00 to 6:00, from 10:00 to 12:00, from 16:00 to 18:00, from 24:00 to 1:00 a.m.

17. Statistically, people with morning biorhythmic type of work efficiency constitute 40%; people with arrhythmic type of work efficiency – 31%; people with an evening biorhythmic type of work efficiency – 29%.
18. There where studies of some low-frequency biorhythms of a person, in particular, emotional activity (with a period of 28 days), physical activity (with a period of 23 days) and intellectual activity (with a period of 33 days).

Pay attention! Each of these low-frequency biorhythms begins at the birth moment. Every change of biorhythms occurs in a sinusoid divided into two semi-periods; the transition from one semi-period to another means a transition through zero (the so-called crisis point). Crisis point (day of life) is associated with a decrease in emotional, physical and intellectual activity. The days in which two or three crisis points coincide at once are considered as the most dangerous.

NON MULTA, SED MULTUM

The first one to speak about the presence of low-frequency biorhythms of emotional and physical condition of a person was Berlin physician Flis in 1897. He noticed that attacks of bronchial asthma and some other diseases usually arise to patients every 28 days. In some cases, he observed an interval of 23 days. Trying to explain this phenomenon Flis suggested that the mood and physical well-being of a person depends on these two cycles. At the beginning of the last century, independently of Flis, the Viennese psychologist G. Freedom confirmed the existence of physical and emotional cycles. He called them "male" and "female" rhythms. The scientist believed that [illegible] physical strength, courage, will and stability fluctuate [illegible] 23 days, and emotional excitability, sensitivity, intuition [illegible] period of 28 days.

Somewhat later, [illegible] Dartmouth F.Telcher published his observations [illegible] examinations by college students. He compared assessments with the students' date of birth and noticed that the student's success varies with a period equal to 33 days (16.5 days - positive phase and 16.5 - negative). Telcher suggested that biorhythms originate in brain cells, since the first 16.5 days are characterized by better memory, creative activity, clarity of thought than the second half of the cycle. The weakest intellectual activity is in the "crisis day" when the sinusoid passes through zero.

Since then, many such studies have been conducted. Some of them confirmed the hypothesis of three rhythms, some of them did not. The practical implementation of the theory of three rhythms from May 1968 to August 1969 in Japan's bus fleets allowed to reduce the number of accidents to zero and thus save more than 20 thousand dollars.

Analyzing the accidents that took place in the mining industry in the 70 years of the last century over a two-year period, Polish engineer Mruck, concluded that traumatism depended on the state of man's biorhythms. After implementing measures that took into account three low-frequency biorhythms, the number of accidents decreased by more than a third.

The theory of three rhythms aroused lively interest also to Soviet specialists. The research by MD professor Agadjanyan allowed to determinethe periods of three cycles more accurately: the duration of physical biorhythm is 23,7 days, emotional - 28,4 days, intellectual - 33,2 days. In support of their hypothesis, specialists from the laboratory of biorhythmology chose 315 names of outstanding people from the Great Soviet Encyclopedia whose birth and death dates were known and calculated their biorhythms. It turned out that mortality in double "crisis days", when the two

zeros of any cycle coincide, is almost 40 times higher than in any other day!

19. To calculate the days of emotional, physical or intellectual crisis, it is necessary to count the number of days a person has lived from birth till the day that is being studied.

EXAMPLE 2. Define the days of the emotional crisis as of 01 October 2011, when the birthday of the person is March 6, 1991.

SOLUTIONS:

1. We count the number of days N, lived by a person from his/her birthday until October 1, 2011 inclusive.

On the date of calculation, a person has 20 full years, so 365 • 20 = 7300 days. In addition, we take into account the leap years lived by a person: 2008, 2004, 2000, 1996, 1992, when the number of days in the year was 366, therefore, it is necessary to add another 5 days. And [illegible] calendar, we count the number of days since the [illegible] October 1, 2011 inclusive. It is 209 days. Thus, the number of days lived by this person is N = 7[illegible]

2. Divide the number of days lived for the period of the emotional cycle, recording the result in the form of a simple fraction: $7514 \div 28 = 286\frac{10}{28}$.

3. The result obtained means that during the life of the person 286 complete emotional cycles have passed, and on October 1, 2011 there is the 10th day of the emotional cycle.

Conclusion:

1) the next day of the crisis emotional state is coming up in 4 days after October 1, 2011, so this is October 5, 2011. This day corresponds to the situation when the first semi-period of 14 days comes into the second semi-period of the same duration.

2) The next days of the emotional crisis after this one will be on October 19, 2011, on November 2, 2011, on November 16, 2011, and so on.

20. Low-frequency biorhythms of emotional state with a period of 28 days are characteristic of all people. The concordance of these biorhythms means the emotional compatibility of people.
21. The complete coincidence of the emotional biorhythmic activity cycles is observed in twins and people who have a difference at the age of 28 days, or this difference in the number of days is multiple of 28. Instead, the displacement of emotional biorhythmic activity cycles on the half-period T/2 (that is, for 14 days) means complete emotional incompatibility of two people.
22. The emotional biorhythmic compatibility (or incompatibility) of two people can be calculated as the ratio of the displacement of their emotional activity cycles to the interval of time, which is equal to the half-cycle of the biorhythmic cycle (14 days).
23. In the same way, physical and intellectual compatibility of any two persons can be calculated according to biorhythmic activity data.

REMEMBER! Complete compatibility of two people is achieved when [illegible] cycles of activity - emotional, physical and intellectual - are fully combined.

Created in a such way educational text "immerses" the reader into a cognitive environment, where the realization of knowledge as a ternary matrix takes place in a sequence that provides a meaningful transition from one knowledge to another, from one training components (blocks) to others.

Working with such textbook on a paper carrier, student is placed in the center of a constructed cognitive environment, and "takes over" information flows from four educational units (blocks) – BSB, CSS, SSB, ASB which are coherent, interferentially enhanced in space and time due to the agreement between the authors about their content, coherence and proper location in the textbook. Finally, it is noteworthy that such a multi-level structure of information (in contrast to plane, linear) to some extent brings the paper textbook closer to electronic. Moreover, the educational components of such textbook can be transformed into an electronic textbook. And the educational components of such textbook, as separate "clips", are combined by the performative text of the basic study block (BSB) into one coherent whole. Fragmentary, "clip" perception of information, peculiar to modern youth, does not dissipate in such a textbook, but on the contrary, synergistically intensifies each fragment and works on the result: the knowledge acquisition.

3. Conclusions

The information society forces educators to create new learning technologies. In the new educational paradigm, student becomes intrinsically central figure in the educational process. From now on, pedagogy should focus on managing information for the implementation of cognitive activities of students, and not on teaching, characteristic for the industrial society era. For this reason, coursebooks should become fundamentally different. The presented principles of constructing the textbook with four types of information study blocks were implemented by the authors in the first (2012) [12] and the second (2014) [13] editions of the coursebook "Life Protection. University course". The positive experience encouraged the authors to transfer the abovementioned principles on the educational discipline "Civil Protection" and to create a coursebook "Civil Protection. University course" [14]. The introduction of these coursebooks into the educational process has significantly increased the quality of learning due to the developement of the most rational way of learning the curriculum material, establishing and strengthening the associative relationship between new and pre-existing knowledge and implementation of a personality-oriented approach to learning.

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