კვების მრეწველობის დარგის მომავალი ინჟინერ-ტექნოლოგების ჯანმრთელობის დამზოგავი საფუძვლების შესწავლის მეთოდიკა

THEMETHODOLOGY OFTEACHING THE BASIS OF HEALTH-SAVING FOR THE FUTURE ENGINEERS-TECHNOLOGISTS OF THE FOOD INDUSTRY

ტატიანა ლაზარევა,
ეკონომიკის მეცნიერებათა დოქტორი,
პროფესორი, კვებისა და ქიმიური ტექნოლოგიების კათედრა უკრაინის საინჟინრო-პედაგოგიური აკადემია
ოლგა ბლაგიი,
ეკონომიკის მეცნიერებათა კანდიდატი, ასისტენტ პროფესორი, კვებისა და ქიმიური ტექნოლოგიების კათედრა უკრაინის საინჟინრო-პედაგოგიური აკადემია

TETIANA LAZARIEVA,
Doctor of pedagogical Sciences, Professor Department of Food and Chemical Technology Ukrainian Engineering-Pedagogics Academy
OLGA BLAHYI,
Candidate of pedagogical Sciences, Assistant of Professor Department of Food and Chemical Technology Ukrainian Engineering-Pedagogics Academy

ABSTRACT

The research was theoretically grounded methodology of teaching the basis of health-saving for the future engineers-technologists of the food industry as goals and content reflecting the medical and phisiological, biological and technological components; differential and integrated method involving two stages of mastering the content of education (the first stage provides a separate learning medical and phisiological, biological and technological components of the content, the second stage is integrated); training, which is information backup method; forms of training, modeling of professional activity of future specialists for developing health-saving products in real production conditions.

Key Words: *professional training, future engineer-technologists of the food industry, health-saving competence, training method, content model, differential-integrated method, professionally-oriented tasks, poliprofessional lectures, poliprofessional business games.*

ანოტაცია

თეორიულად დასაბუთებულია და შემუშავებულია კვების მრეწველობის მომავალი ინჟინერ-ტექნოლოგების ჯანმრთელობის დამზოგავი საფუძვლების შესწავლის მეთოდიკა, რომლის რეალიზაციაც ხორციელდება მედიკო-ფიზიოლოგიური, ბიოლოგიური და ტექნოლოგიური შემადგენლების ინტეგრაციის გზით, რომელიც ეფუძნება კომპეტენტური და სისტემური მიდგომების ერთიანობის საფუძველზე აღნიშნული სპეციალისტების მომზადებას. დაზუსტებული და წარმოდგენილია მომავალი ინჟინერ-ტექნოლოგების ჯანმრთელობის დამზოგავი საფუძვლების სწავლების შინაარსი. თეორიულად დასაბუთებულია და შემუშავებულია ჯანმრთელობის დამზოგავი საფუძვლების შესწავლის დიფერენციალურ-ინტეგრირებული მეთოდი კვების მრეწველობის მომავალი ინჟინერ-ტექნოლოგებისათვის, რომელიც ითვალისწინებს სწავლების ორ ეტაპს. პირველ ეტაპზე ხორციელდება შინაარსის მედიკო-ფიზიოლოგიური, ბიოლოგიური და ტექნოლოგიური შემადგენლების დიფერენცირებული ათვისება, ხოლო მეორე ეტაპზე ხორციელდება მათი ინტეგრირებული სწავლება. განსაზღვრულია სპეციალისტებისთვის ჯანმრთელობის დამზოგავი საფუძვლების შესწავლის საშუალებები, კერძოდ, შემუშავებულია პროფესიულ-ორიენტირებული ამოცანების სისტემა, რომელიც უზრუნველყოფს მედიკო-ფიზიოლოგიური, ბიოლოგიური და ტექნოლოგიური შემადგენლების ინტეგრაციას. წარმოდგენილია კვების მრეწველობის მომავალი ინჟინერ - ტექნოლოგების სწავლების ფორმები, რომლებიც უზრუნველყოფენ ცალკეული პროფესიულად აუცილებელი ჯანმრთელობის დამზოგავი უნარ-თვისებების ჩამოყალიბებას მისი კომპლექსურად გამოყენების შემთხვევაში. შემოთავაზებულია ნახევრადპროფესიული ლექციები და საქმიანი თამაშები.

საკვანძო სიტყვები: *პროფესიული არევა, კვების მრეწველობის მომავალი ინჟინერ ტექნოლოგები, პროფესიულად ორიენტირებული ამოცანები, ნახევრადპროფესიული ლექციები, ნახევრადპროფესიული ბიზნეს-თამაშები*

INTRODUCTION

The modern labor market puts in new claims on the vocational training of engineers-technologists of the

food industry and their ability to develop and implement health-saving food products. This calls for training the future specialists in the basis of health saving purposely to ensure the state program for the organization of production of health-saving products in the food industry.

The teaching methodology consists of a complex of hierarchically related components: goals, content, methods, means of training and forms of learning activity that form a single integral functional structure [1]. Thus, the structure of the methodical system of training of future engineers-technologistsof the food industry in the process of learning the basis of health-saving provides theoretical substantiation and development of the components such as:

1. Training goals that determine the specific knowledge, skills and professionally important qualities that are the main health-saving activities of future professionals in the development of health-saving products.

2. Advanced content of training, which reproduces the current trends of the food industrydevelopment.

3. Teaching methods for the development of the requirement content of future specialiststraining, the formation of abilities, skills, experience of health-saving activities.

4. Means and forms of training for reflecting the content and methods of training of futureengineers-technologists.

The aim of the research is the theoretical substantiation of the teachingmethodology the basis of health-savingfor future engineers-technologistsof the food industry.

1. GOALS OF TEACHING THE BASIS OF HEALTH-SAVING FOR FUTURE ENGINEERS-TECHNOLOGISTS OF THE FOOD INDUSTRY

The goals of training are the first backbone element of the methodology of training futureengineers-technologistsof the food industry. The goal characterizes the future state of the subject of activity, the ideal result to which is aspired and must be achieved with the help of certain actions or motivated activity [2]. Thus, in the process of learning the basis of health-savingfor the future engineers-technologists of the food industry should be put and achieved:

- training goals for the formation of knowledge, skills and experience in the performance of production functions and operations for the development and production of health-saving food products;
- developing goals that forsee the development of intellectual, emotional, volitional, activity-behavioral sphere of the individual and they are aimed at the formation of professionally important qualities of the future specialists;
- educational goals which are aimed at the formation of valuable attitude to their own health and the health of the consumers, as well as the involvement of society in the preservation and development of health through the consumption of health-saving products.

Analysis of academic papers and researchs of the scientists allowed us to conclude that the purpose of learning the basis of health-savingfor thefutureengineers-technologistsof the food industry form a hierarchical structure, namely:

– thegoals of a medical and phisiologicalcomponent;
– the goals of the biological component;
– thegoals of the technological componentformation.

Let us consider the objectives of the formation of medical and phisiologicalcomponent of training in the basis of health-savingfor thefuture engineers-technologists of the food industry. So, based on the views of the scientists, according to the medical and phisiologicalcomponent, future specialists should possess knowledge, skills and abilities on the internal needs of the human body, depending on age; gender; physical activity; the functional state of organs and systems.

Based on the scientific works analysis it was determined that in order the biological component of learning the basis of health-savingfor thefuture engineers-technologists of food industry should include knowledge and skills, that take into account:

– types of food raw materials and healthy supplements;
– nutrient composition of food raw materials and healthy supplements based on microorganisms, mushrooms, plant and animal origin, hydrobionts, products of processing of insects, minerals and biologically active supplements;
– criteria for the selection of food raw materials and healthy supplements based on microorganisms, mushrooms, plant and animal origin, hydrobionts, products of processing of insects, minerals and biologically active supplements.

According to the analysis of the scientists the goals of formation of the technological component of teaching the basis of health-savingfor thefutureengineers-technologistsof the food industry as a system of knowledge and skills to determine the technological parameters:

– health-saving raw materials and supplements;
– production of health-saving grain-flour, bakery, dairy, oil and fat products, meat and fish products and beverages;

– esteblishment of health-saving raw materials and supplements into the products.

It should be noted that according to the results of B. Bloom research [3], the aims of learning are hierarchically dependent on the mental processes, such as memorizing, understanding, application, analysis, evaluation and synthesis.

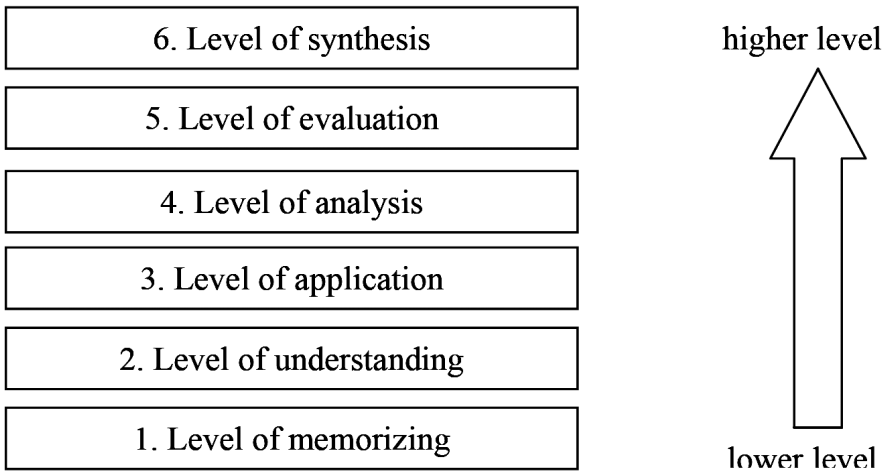

Figure. 1. Hierarchy of goals for B. Bloom research[3]

At the same time, the scientists [4, 5]correlate the level of memorizing to the reproductive level (introductory and indicative), the level of understanding, application, analysis and evaluation to the productive (conceptual and analytical), and the level of synthesis is considered to be creative (productive and synthetic) level of knowledge assimilation (Fig. 2). Thus, the reproductive level involves the reproduction of educational information on the basis of its conscious perception and fixation in memory. The next, exactly the productive level, characterizes the understanding, application, analysis and evaluation of knowledge and skills, as well as their application in a typical situation. The creative level is responsible for the reproduction and application of knowledge and skills in an atypical, non-standard situation. This encourages the future specialist to search for creative ideas. Therefore, the objectives of training in the basis of health-savingfor thefutureengineers-technologists of the food industry should meet the reproductive, productive and creative levels of knowledge and skills.

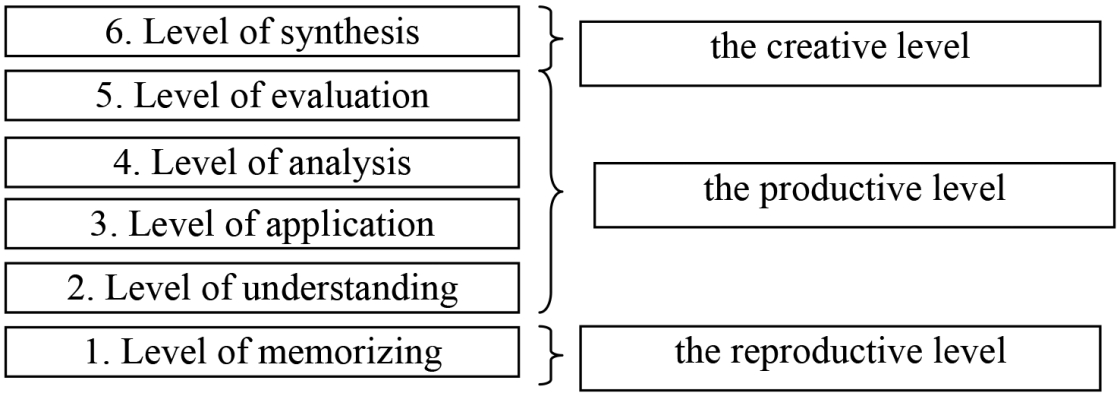

Figure. 2. Hierarchy of learning goals by levels of knowledge formation and skills

We are going todetermine the professionally important qualitiesin the structure of the teachinggoals the basis of health-saving that should be developed and formed in the future specialists of the food industry.

Scientists reveal the need for the formation of the following professionally important qualities of the future specialists: the interest in the profession;commitment to professional growth, self-discipline, interest in people, love of children, empathy, tolerance, responsibility; willingness to take risks and accept non-standard solutions; diligence; sociability; organizationalcommunication skills; friendliness; attentiveness, self-discipline, initiative, energy, perseverance, morality; personal activity; independence. However, the authors attempts to systematize the features by groups do not reveal the completeness of the requirements to the qualities of the future engineers-technologists of the food industry in the process of their vocational training, but only fragmentary determine the elements of the structure.

Professionally important qualities of the future engineers-technologistsof the food industry are disclosed in detail in the works of the scientists and the following groups are highlighted:

– a package of motivational and objective qualities, which includes motivation of the importance of professional activity, motivation of success in professional activities, the desire in creative professional activity;
– a package of cognitive qualities that represents the abilities of sensation, perception, imagination, representation, thinking, attention, memory;
– a package of ideological qualities, namely moral;
– a package of organizational and activity qualities such as personal and social activity.

The suggested structure is a generalized system of professionally important qualities of the engineers-technologistsof the food industry and should be the basis of those professionally important qualities that form the health-saving activities of the future professionals.

2. The content of training in the basis of health-saving for the future engineers-technologists of the food industry

The structure of the teachinggoals the basis of health-savingfor thefuture engineers-technologists of the food industry is the basis for the development of the content of training. Thus, the learning goals allow to identify interrelated components of the content: medico-phisiological, biological and technological pecularities.

So, we define the medical and phisiologicalcomponent of the content of training the basis ofhealth-savingfor thefuture engineers-technologistsof the food industry. According to the scientists an urgent task that is faced by process engineers is to develop food products aimed at health-saving of children of different ages. In addition, the necessity of developing health-saving products for men and women, especially pregnant women, childbirthing and nursing. A significant number of scientistsin their works address the issue of nutrition of old people and the need to develop food products gerodietetic direction. At the same time, others support the development of health-saving products according to the physical activity of the consumers and athletes.

Except for certain dirrections the scientists also consider the relevance of the development and manufacture of health-saving products that can improve the performance of organs and systems of the body. According to the analysis, the content of the medical and phisiologicalcomponent should contain information about the functional state of organs and systems of the consumer, namely: nervous, cardiovascular, digestive, endocrine, sexual and excretory, cover systems and musculoskeletal system.

Sothe content of the medical and phisiological component should be aimed at training of the future engineers-technologists to develop and produce health-saving products for consumers in the following areas:

– by age: for children, adults, the elderly;
– by gender: for men and women;
– by groups of physical activity: for workers mainly of intellectual work; for workers engaged in light work; workers in moderate work; for workers of heavy physical work;
– the functional state of the organs and systems of the consumer as nervous, cardiovascular, digestive, endocrine, sexual and excretory, integument systems and musculoskeletal system.

The content of the biological component should be aimed at training of the future engineers-technologiststo develop health-saving products, which take into account the therapeutic (or healing) properties of microorganisms, muchrooms, plants and animals, birds, hydrobionts, insects, minerals and biologically active suplements.

The content of the technological component should provide training for future specialists in the development and production of health-saving products such as grain flour and bakery products, dairy, meat and oil-butter products, fish products, beverages.

The developed model of the content of training in the basis health-savingfor the future engineer-technologists of the food industry is given in Fig. 3.

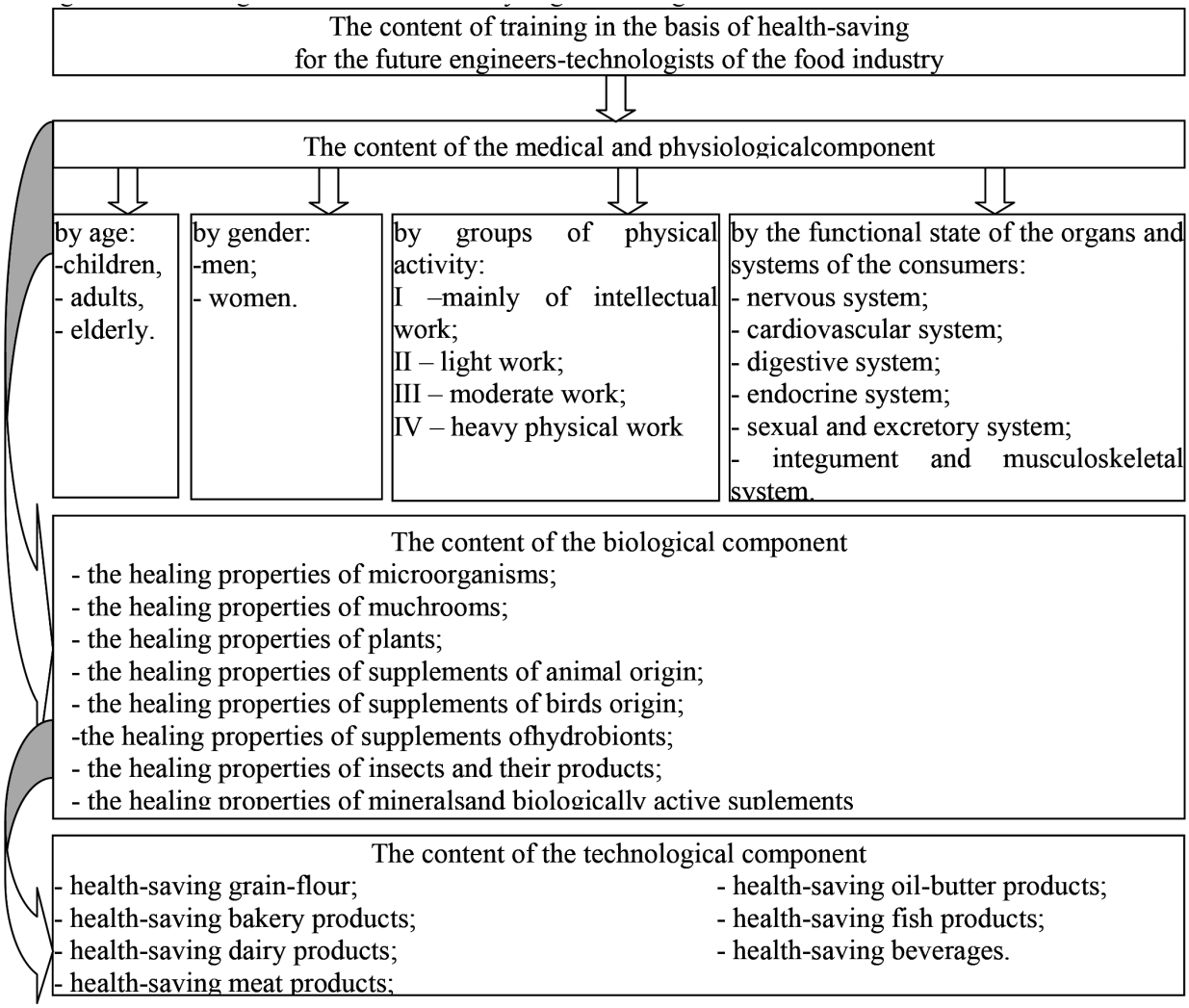

Figure. 3. Model of the content of teaching the basis of health-saving for the future engineers-technologistsof food industry

3. METHOD OF TEACHING THE BASIS OF HEALTH-SAVING FOR THE FUTURE ENGINEER-TECHNOLOGISTS OF THE FOOD INDUSTRY

The learning of the content of training in the basis of health-savingfor thefutureengineers-technologistsof the food industry is ensured to be integrated through the selected methods and means of training.

At the stage of development of the trainingmethod of the future engineers-technologists of the food industry, it is important to identify two successive stages of the interaction of the content components such as differentiation and integration (Fig. 4).

Thus, at the first stage, fundamental and general professional knowledge is formed, and at the second stage, due to the solution of complex professional tasks, there is a process of integration, which provides training in the basis of health-saving protection of future specialists.

The formation of skills and abilities in the process of mastering the components of the content of training takes place in a certain sequence. One of the ways to improve the learning process, according to I. Cheredova is allocation of several levels of knowledgeformation, abilities and skills of future specialists [6]. Psychological and pedagogical researches show that in the process of mastering professional knowledge has three interrelated levels: reproductive, productive and creative. Methods of reproductive level of education form the basis of concepts, their initial understanding and memorization. The level of productive reproduction and application of knowledge in different conditions is responsible for the versatile reproduction and understanding of the basics of concepts, their addition to new information and the formation of skills to link these concepts with new information. The

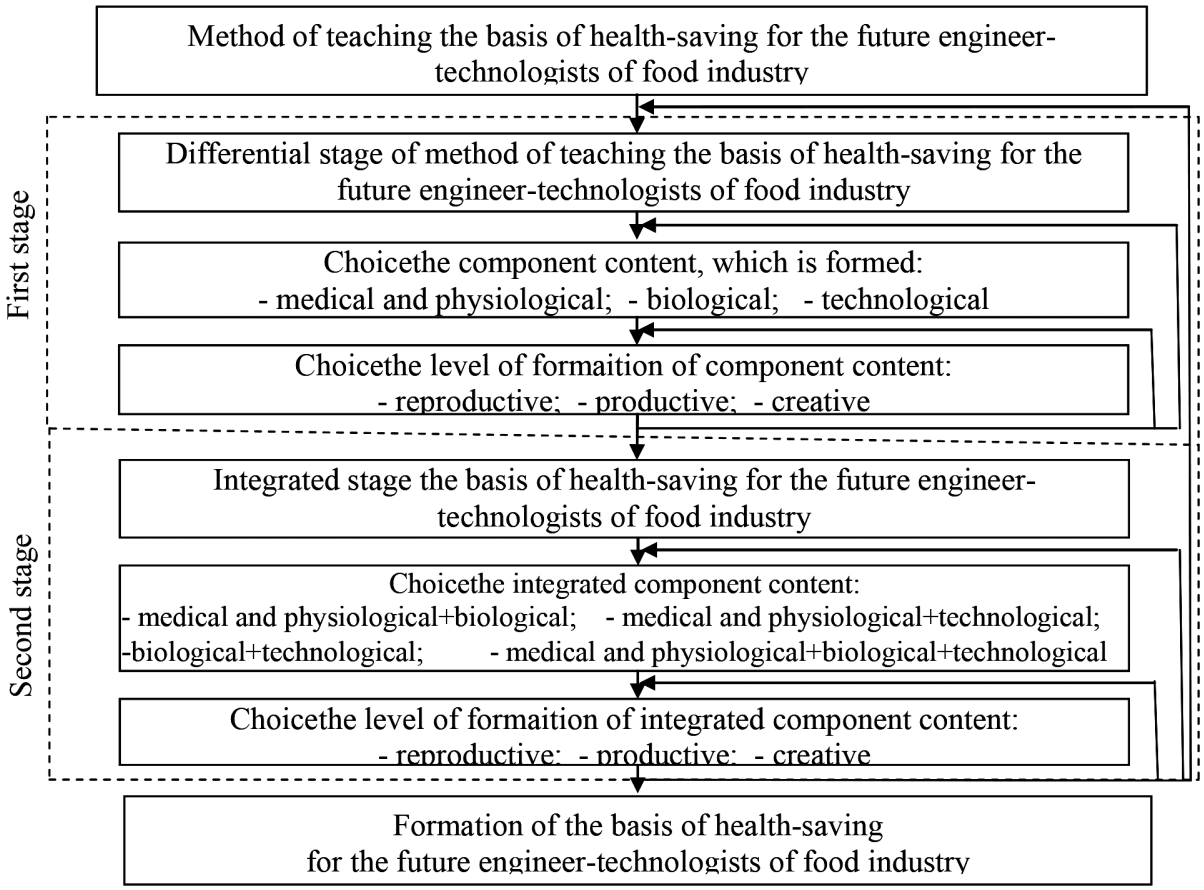

Figure. 4. Differential and integrated method of teaching the basis of health-saving for the future engineer-technologists of food industry

level of creative application of knowledge is appropriate in the process of new problemsemergence, hypotheses and search for their solutions.

Training in the basis of health-savingfor the future engineers-technologistsof the food industry is possible in the conditions of productive educational activities. This is implemented in the introduction in the educational process of training of the future engineers-technologistsof the task method of training [7, 8, 9]. The following principles should be followed by developing professional and oriented tasks:

1. In the context of the tasks it should be reflected that allow you to highlight all the problems of the development of health-saving products. Such tasks will contribute to the formation and consolidation of skills that meet modern production requirements. So they allow to model the future professional activity of engineers-technologistsof the food industry.

2. The solution of problems should be based on the interrelations of themedical and phisiological, biological and technological components of the content, which will ensure their consistent integration.

Therefore, in the process of developing health-saving products, future professionals should decideand solve a variety of professionally-oriented tasks. This allows you to simulate the professional activities of the specialists in the development and production of health-saving products. The introduction of the task method of training creates conditions for the assimilation of knowledge, the development of systemic thinking, concentration, perception and sensation of phenomena, processes, modes, raw materials and products.

The basis for the development of the goals of education health-saving for the future engineers-technologistsof the food industry of the selected typology of task D. Tollynger and V. Laudis [9, 10]. Nevertheless, we propose to distribute groups of tasks in accordance with the goals and content of training on reproductive, productive and creative. Thus, the tasks for the development of health-saving products of reproductive level include the following:

1. Tasks that involve the reproduction of knowledge.

2. Tasks that involve simple mental actions.

We consider the following tasks of the development of health-saving products of a productive level, providing training in the basics of health-saving of thefutureengineers-technologistsof the food industry:

1. Tasks that involve complex mental operations.

2. Tasks that involve the generalization of knowledge and delivery of objects.

3. Tasks that involve some productive thinking.

Next, we define the tasks of the creative level of training in the basis of health-savingfor thefutureengineers-technologistsof the food industry as:

1. Tasks on heuristic search by logical thinking.

2. Tasks to build strategies to joint and individual solutions to problem situations.

Thus, the suggested structure of task training contributes to the formation of an effective system of gradual learning of the trainingcontent. At the same time, the conditions of professionally-oriented tasks allow modeling the real professional activity of the future specialists in the development of health-saving products.

4. MEANS OF TEACHING THE BASIS OF HEALTH-SAVING FOR THE FUTURE ENGINEERS-TECHNOLOGISTS OF THE FOOD INDUSTRY

Let is consider the means of training to ensure the solution of the presented professionally-oriented tasks. Scientists describes a considerable number of classifications of the means of the future specialiststraining. Among them, the most justified is the classification of teaching health-saving by the nature of their representation of the surrounding reality, which is taken as a basis in the methodology of teaching the basis of health-savingfor thefutureengineers-technologistsof the food industry [11]. Thus, a certain classification of learning means is shown in Fig. 5.

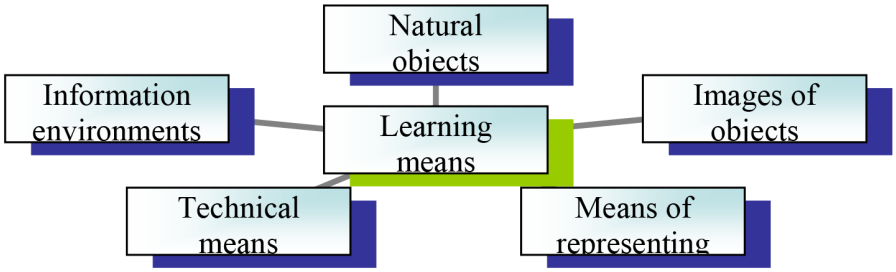

Figure. 5. Classification of learning means

So, the structure of training means assume their division into the following groups:

– natural objects that include the collection of raw materials, plants, herbaria, models and stuffed animals, hydrobionts, insects, mineral samples, microsections, reagents, and also training and production, demonstration and laboratory equipment;

– images and displays of material objects: stands, diagrams, illustrations, video and slide presentations;

– means of training, representing the description of subjects and phenomena of objective reality, namely text tables, maps, textbooks (textbooks and manuals, collections of tasks, instructions for independent work, didactic materials);

– technical means of training, including films, computer programs and electronic computers;

– information environments, such as Internet information resources.

5. FORMS OF TRAINING IN THE BASIS OF HEALTH-SAVING FOR THE FUTURE ENGINEERS-TECHNOLOGISTS OF THE FOOD INDUSTRY

Let us consider the following element of the method of teaching the basis of health-savingfor thefuture engineers-technologistsof the food industry as the form of studentstraining. Thus, the form of organization of the educational process is a purposeful, well-organized order and established mode of joint activity of the teacher and students in the learning process [12]. Forms of trainingorganization are divided into frontal, individual, pair, group (collective) forms [13].

The frontal form is aimed at simultaneous training of a group of students who solve the same type of problems with the subsequent control of the results by the teacher [14]. This classical form is quite effective at the stage of teaching some new material. The use of the frontal form

in the learning process allows students to reduce the time spent on self-search and selection of basic educational information. Thus, its use allows to form knowledge of reproductive and productive level. However, this form of training allows teachers to convey to students the importance of their future professional activities, to convince them of the need to create innovative products that will improve the health of a significant number of consumers. Therefore, the use of the frontal form ensures the formation of the futureengineers-technologistsof the food industry motivation for professional activities in the development of health-saving products, as well as qualities such as responsibility for the life of each consumer, civil dignity. At the same time, moral qualities are formed, namely: humanity and respect for consumers.

In the process of frontal training, basic cognitive professional qualities are formed as mnemonic ability to memorize large amounts of information on the medical and phisiological, biological and technological components, the ability to concentrate attention in the process of creating health-saving products, imagination and representation of the state, phenomena and processes. In professional work, these qualities allow the specialist to maximize the use of raw materials, to choose the optimum technological parameters of the production of improving production and productive use of time. Therefore, the frontal forms of training are the foundation for the training of the future engineers-technologistsof the food industry and ensure the sustainable development of certain professionally important qualities. Therefore, it is an important element of the method of teaching the basis of health-savingfor thefuture specialists.

The individual form of the organization of studentstraining is capable to provide formation of knowledge at all three levels. This way of organizing work is aimed at taking into account the mental abilities of each student and the choice of tasks in accordance with their capabilities. In the future professional activity this form is realized in the direct process of development of a compounding, technology of improving production or improvement of the existing technological parameters of its production. At the same time, experts should show their individual ability to invent, to reveal their intellectual and creative potential. Therefore, in the process of individual training should take into account the need for the formation of such professionally important qualities as the desire for creative activity to make health-saving products, motivation to succeed in creating health-saving products and a number of cognitive qualities as the ability of imagination and representation of the state, phenomena and processes with the medical and phisiological, biological and technological components and the ability to system thinking. Since the development of health-saving products is aimed at mass social consumption, the future engineers-technologists of the food industry should have such moral qualities as honesty, discipline, demands on themselves and their work, civil dignity.

In addition to these characteristics, the future leadership and the highest rank colleagues require the future specialist of universal moral qualities, namely empathy and respect for consumers. At the same time, in the process of implementing their own ideas for the development of health-saving products will be necessary such personal qualities of activity as determination and perseverance.

Therefore, the use of individual forms of training of the future engineers-technologists of the food industry should ensure the formation of a system of these professionally important qualities.

Group (collective) form of organization of training involves the interaction of a group of students with each other and the teacher in the process of solving problems[13]. Application of the specified form of the organization of educational process allows to bring as close as possible educational process to professional practical activity. At the same time, the pair form provides for a joint task by a pair of students under the guidance of a teacher [13]. This form of learning organization promotes competition [15], so students are more creative and fervent in solving problems. So, in the future professional activity this form is realized in real professional tasks of the enterprise as well as in need to correspond to modern requirements of consumption only of qualitative improving production of food. At the same time, the company's management is interested in increased demand for products and reducing its cost. Such professional tasks have a large amount of work and a wide range of professional issues, ranging from commodity characteristics of raw materials and ending with the calculation of the cost of the finished product. Because this amount of work is too much for one employee, it is assigned to a group of people. That is why, future engineers-technologistsof the food industry should be ready for steam or collective professional activity. In the process of such work, future specialists should be motivated to achieve success in the creation of health-saving products. At the same time, directly in the process of development of health-saving products future professionals need to have a number of formed cognitive professional qualities, namely the ability to perceive and feel the phenomena, processes, raw materials and products.

It is also important in the development of health-saving products to maintain a high level of moral relations with people. Moral qualities as responsibility for life of each consumer and social and activity qualities such as abilities to the organization of developmentprocess of improving production is guarantee of production of qualitative improving production. The presented qualities can be formed only in the process of active group, collective and pair forms of education.

In the process of learning the basis of health-savingfor thefuture engineers-technologists of the food industry is optimal integrated application of forms of training. Depending on the form used, the types of organization of educational and cognitive activity are chosen. Such types of training of the future specialists can be lectures, seminars, practical and laboratory classes, independent work and others. The choice of forms of training provides optimal conditions for the implementation of certain goals, content, methods and means of teaching the basis of health-savingfor thefuture engineers-technologistsof the food industry. Therefore, the form of instruction should reflect poliprofessional health-saving activities for themedico-phisiological, biological and technological components.

CONCLUSIONS

Theoretically substantiated methodology of teaching the basis of health-saving which includes goals, content model, differential and integrated method, means and forms of training of the futureengineers-technologistsof the food industry. This technique creates the necessary conditions for the formation of knowledge, skills, professionally important qualities of health-saving. This allows future engineers-technologists of the food industry in the process of professional activity to develop health-saving products.

REFERENCES

[1] **Pyshkalo A.** Metodycheskaia systema obuchenyia heometryy v nachalnoi shkole : avtorskyi doklad po monohrafyy «Metodyka obuchenyia ɜlementam heometryy v nachalnykh klassakh», predstavlennoi na soyskanye uchenoi stepeny d-ra ped. nauk. M.: Akademyia ped. nauk SSSR, 1975. 60 s.

[2] Fylosofskyi slovar. Pod red. Frolova Y. M.: Polytyzdat, 1986. 590 s.

[3] **Pometun O.** Shcho take taksonomiia Bluma i yak vona pratsiuie na urotsi. Osvitnia platforma «Krytychne myslennia» : sait. URL: http://www.criticalthinking.expert/usi-materialy/shho-take-taksonomiya-bluma-i-yak-vona-pratsyuye-na-urotsi/.

[4] **Zahviazynskyi V.** Ynnovatsyonnye protsessy v obrazovanyyy pedahohycheskaia nauka. Ynnovatsyonnye protsessy v obrazovanyy: sb. nauch. tr. Tiumen: Tiumen. hos. un-t, 1990. S.5.

[5] **Salov V.** Osnovy pedahohiky vyshchoi shkoly : navch. posib. Dnipropetrovsk : NHU, 2003. 170 s.

[6] **Monakhov V.,** Orlov V. Dyferentsyatsyia obuchenyia v srednei shkole. Sovetskaia pedahohyka. Moskva, 1991. № 8. S. 42—47.

[7] **Kostiuk H., Ball H., Mashbyts E.** O zadachnom podkhode k yssledovanyiu uchebnoi deiatelnosty. Psykholohyia chelovecheskoho uchenyia y reshenye problem: 2-ya Prazhskaia konf. Praha, 1973. S. 70.

[8] **Talyzyna N.** Upravlenye protsessom usvoenyia znanyi (psykholohycheskye osnovy). yzd. 2-e, dop., yspr. M. : MHU, 1984. 345 s.

[9] **Tollynherova D., Holoushova D., Kantorkova H.** Psykholohyia proektyrovanyia umstvennoho razvytyia detei. M. : Rospedahentstvo, 1994. 48 s.

[10] **Liaudys V.** Metodyka prepodavanyia psykholohyy: ucheb. posobye. 5-e yzd. SPb. : Pyter, 2008. 192 s.

[11] **Shapovalenko S.** Metodyka obuchenyia khymyy v vosmyletnei y srednei shkole: obshchye voprosy : posobye. M.: Uchpedhyz, 1963. 663s.

[12] **Zynovkyna M.** Formyrovanye tvorcheskoho tekhnycheskoho myshlenyia y ynzhenernykh umenyi studentov tekhnycheskykh vuzov: dys. d-ra ped. nauk: 13.00.01. M., 1989. 326 s.

[13] **Sytarov V.** Dydaktyka: ucheb. posobye. M.: Akademyia, 2004. 368 s.

[14] **Iakovyshyn P.** Teoretychni ta metodychni osnovy navchannia studentiv metodiv analizu i syntezu mekhanizmiv i mashyn : avtoref. dys. d-ra ped. nauk : 13.00.04. Kyiv, 2001. 41 s.

[15] **Iakunyn V.** Pedahohycheskaia psykholohyia. SPb.: Yzd-vo Mykhailova V., 2000. 349 s.