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S. V. Roman, SE "Luhansk Taras Shevchenko National University"

PURPOSES AND TASKS OF MODERN SCHOOL CHEMICAL EDUCATION

Roman S. V.

Purposes and Tasks of Modern School Chemical Education

The purpose of modern school chemical education is formation humane eco-chemically and competent creative person who understands life and the nature as the highest values, realizes requirement of preservation of the biosphere as an indispensable condition not only existence, but also development of humanity. For a specification of the specified purpose approaches of scientists to the principles of formation of the purposes are adapted, and also the additional principles of formation of the purposes to which we referred are formulated: principle of a dialectic contradiction of the purpose (unity of requirements of society and interests of the personality, public inquiries and self-realization of the school student); the principle of determination is more whole modern calls of a civilization, in particular spiritual crisis and ecological instability in the world; the principle of possible forecasting is more whole than development of the identity of the school student on the basis of methodology of a sustainable development of mankind and "green chemistry". The purposes of modern school chemical education in the context of the common didactic goals (educational, educational, developing), and also according to hierarchy of the purposes of training in two aspects (the strategic, tactical and operational objectives are formulated; social purposes, purposes of formation of concrete educational institution, purpose of studying of separate subjects, sections, educational subjects, lessons). In turn, they have to define the modern contents, structure, dynamics and realization of the used methods, technologies and means of study of chemistry.

Key words: the purpose, the principles of construction are more whole, the hierarchy is more whole than training, formation of ecological and humanistic values, school chemical education.

Achievement of the predicted results of training directly depends on the clearness of the formulation of the common and specific educational goals and adequacy of a choice of strategy of training. However, despite of the general recognition of designing of the purposes the most important characteristic of educational process and the leading component of its design (Yu. Babanskiy, V. Bespalko, V. Krayevskiy, V. Slastenin, N. Talyzina and others), uniform approach

to definition of concept “purpose”, the general requirements and the principles of the formulation of the purposes, levels of designing of the purposes among scientists aren't present. The analysis of definitions of concept “purpose” testifies that depending on a stage of knowledge of object, a stage of the system analysis this concept gets different shades – from ideal aspirations to specific goals – the end results which are reached within some interval of time and are formulated sometimes in terms of the final product of activity. The contradiction put in concept of the purpose – need to be motivation to action, “the advancing display” (the term is entered by P. Anokhin), or “the advancing idea”, and at the same time a material embodiment of this idea, that is to be accessible [1, p. 21 – 22].

In the context of training of chemistry we will understand ideal anticipation of the end results of training as the purpose; to what aspire the teacher, pupils [2, p. 205]. The educational purpose is the predictable and specified by the teacher result of processes of training and education. In educational process in chemistry of the purpose carry out a number of important functions, namely: provide integrity of educational process, its structural elements in uniform system combine all; are criterion of an assessment of the importance of a training material, and the significance value, in turn, outlines requirement of inclusion of this material in the content of education and ensuring desirable level of its assimilation; define ways and means of the organization of process of training; influence structure of chemical education and a ratio of its elements and by that – on style of thinking of pupils; outline system of means of formation of the personality.

The purpose of educational process – the full and finished training of the pupil for full-fledged life in society through development of his identity, formation and development of his personality. Therefore, the purpose of chemical education in school is assimilation of fundamentals of chemistry for providing with means of chemistry as subject of certain conditions for intellectual development and self-development of the personality, education of the patriotic citizen, and formation at school students of the reasonable emotional and valuable attitude towards itself, other people, and environment.

In view of great opportunities for chemistry concerning education, education and development of pupils, there are all bases to consider that the studying of chemistry at comprehensive school focused on prospect of development of what and humane society through the specific personality has to provide the solution of such tasks:

– formation of scientific outlook of school students on the basis of assimilation of system of chemical knowledge (the major facts, concepts, laws, theories, available generalizations of world outlook character, language of chemical science) and education of the relation to assimilation of chemical knowledge as to a necessary component of culture of each civilized person;

– free development of the personality capable to independent education, increase of intelligence, improvement of memory, observation, ability to express the opinions, to prove judgments, to draw logically correct conclusions – and all this taking into account inclinations and abilities of the pupil;

– development at pupils of understanding of the increased chemistry role in permission of such global problems of mankind, as raw, power, food, ecological;

– formation of rational natural-science thinking, education of eco-centric ecological culture, skills of safe handling of substances in everyday life;

– assistance to self-determination and self-realization of the personality, formation of the relation to chemistry as to possible branch of future practical activities [3, p. 6].

For a further specification of a main objective and tasks of school chemical education by means of the purposes it is necessary to consider first of all approaches of scientists to definition of the main requirements concerning the formulation of the purposes and the principles of designing are more whole. In particular, according to such requirements (L. Gur'e, O. Zheleznyakova, E. Zair-Bek, O. Kazakova, N. Nikitin, M. Petukhov, V. Slastenin and others) the purposes have to be: vital, really accessible, precisely expressed (to point to concrete result of training), full without redundancy, systematized, coordinated, flexible, harmonized, motivated on social values and values of age, tool and technological (to define specific actions

concerning their achievement), diagnosed, that is to give in to measurement, determination of their compliance to results of educational activity and the main qualities of the personality [4, p. 78 – 79; 5, p. 24 – 25; 6, p. 102; 7, p. 42].

Concerning the principles of the formulation is more whole, G. Monakhova suggests to be guided by such: language of creation of the purposes has to be available and clear both to the teacher, and the pupil and his parents (accuracy and clearness of formulations); when designing formulations of the purposes only structural elements of language of creation of the purposes have to be used (“to be able”, “nobility”, “apply” syntactic words, “to have idea about” and others; a purpose body – concepts, operations, statements which accustom, and communications between them); submission of requirements of the standard in language of the purposes (an accurate and clear image of new level to which the pupil at realization of this purpose has to be brought); providing at the formulation of the purpose of its subsequent diagnostics (via the mechanism of the simple fact of establishment of achievement of the purpose by the pupil); strict observance of sequence and procedures when designing the purposes [8, p. 130].

The given principles logically are supplemented with the principles of the formulation of the purposes developed by V. Sharko. These are such principles: specifications – to put forward only those purposes which can be realized at this lesson and material taking into account the available resources – age features of pupils, professional inclinations of teachers, of the contents and conditions of training and others; differentiations – to distribute the common educational goals on such quantity concretized that common goals were achieved, however not at the price of excessive efforts of pupils; continuous diagnostics – at first to put forward common goals, and then to reach them consecutive specification, that is to build "the tree is more whole"; an optimality – the concretized educational purposes have to be accurate, ways of their achievement – obvious, and extent of realization – controllable; productivity – to formulate the various educational purposes which are provided by the content of education, for the purpose of achievement of all-round development of the identity of the pupil in the course of training [9, p. 120].

For more effective and exact designing of the purposes in school chemical education we consider expedient together with the requirements and the principles of the formulation which are already given above is more whole to use three more the principles developed by us.

1. The principle of a dialectic contradiction of the purpose – unity of requirements of society and interests of the personality, public inquiries and independent realization of the pupil (for this purpose it is necessary to know: that want to reach the teacher; that wanted by pupils; what results are necessary to our society).

2. The principle of conditionality is more whole modern calls of a civilization, in particular spiritual crisis and ecological instability in the world.

3. The principle of possible forecasting is more whole than development of the identity of the pupil on methodological bases of a sustainable development of mankind and "green chemistry". According to the Concept of a sustainable development of mankind, the center of attention is transferred to the person: people have to have the right for healthy and fruitful life in harmony with the nature, and environmental protection has to become the integral component of development and can't separately be considered from it. Thus the satisfaction of requirements of development and preservation of environment has to extend not only on the present, but also on all subsequent generations [10, p. 12 – 13]. "The green chemistry" is a chemistry of a sustainable development of mankind in the favorable environment that is introduction of essentially new relations between chemistry and environment, which main motto: "Helping – don't do much harm!". A basis of this strategic approach is selection of such materials and creation of such technologies which will allow excluding in general use of harmful substances and formation of the waste dangerous to environment [11, p. 10].

Besides, training of chemistry, as well as to any other subject, has the common didactic goals – educational, educational and developing which have to be reached in the only educational and educational process. Each of these groups of the purposes is difficult system:

– the educational purposes – form system of the purposes in which allocate categories and consecutive levels – knowledge, understanding, application, the analysis, synthesis, an assessment;

– the purposes of education of the personality – are connected with socialization of pupils, formation of system of morals at them, ideals, values, manuals, views, belief, the relations and so forth (the formulation of the educational purposes includes intellectual, labor, physical, moral, legal, ecological, esthetic training and another);

– the developing purposes – form system of the purposes connected with entering of possible changes into different structural spheres of the pupil (intellectual, mental, spiritual, social, physiological) [12, p. 11 – 12; 13, p. 7].

Taking into account these groups of the didactic purposes, the purposes of school chemical education have to provide design of an individual educational route of ascension of the pupil to understanding of own position in the course of formation of ecological culture, essence of activity on the basis of personal values and meanings and get such innovative formulation:

– educational purposes: formation of system of chemical knowledge on the basis of the major laws and theories of chemistry for an explanation of natural, technogenic processes and everyday occurrences; disclosure of chemical and ecological aspect of universal norms of humanistic morality, its range and concrete contents; creation of conditions for development of creative abilities of pupils in the course of the valuable and directed assimilation of chemical knowledge and carrying out ecologically safe chemical experiment, for independent acquisition of new knowledge of chemistry and search in them new personal meanings according to the arising vital needs;

– purposes of education of the personality: education of the humane personality whom philosophical and world outlook orientation and a reflection in understanding of meaning of life, the place in the world are inherent, in the uniqueness and value, the active valuable relation to the planet Earth, to mankind, properties of material and spiritual culture; education of confidence in need of use of valuable potential of

chemistry for research of the natural and social environment (in the course of creatively motivated educational activity, the solution of regional and local problems), rational environmental management and ecologically competent behavior, the positive relation to chemistry as to one of the most important components of human culture;

– the developing purposes: formation of culturally developed, socially mobile personality capable to apply the gained chemical knowledge, abilities, skills, the acquired valuable orientations socially significant (in particular, common cultural, ecological and humanistic) character in everyday life and work, consciously and responsibly to solve the practical problems connected with safe use of chemicals and materials on their basis to warn the phenomena which do harm to human health and environment, and also to adapt in different life situations.

At the same time process of the formulation of the purposes has to be based also on their hierarchy and differentiation as exactly in that case they will get the greatest optimality and efficiency for all educational process. The theoretical analysis of this aspect testified that there are different approaches to hierarchy of the purposes of training: global, macro- and the micro-purposes [8]; the common, the concrete, focused goals [9]; strategic, tactical and operational objectives [14]; social purposes, purposes of formation of concrete educational institution, purpose of studying of separate subjects, sections, educational subjects, lessons [15].

In creation of the purposes of training of chemistry we will rely on two last approaches to definition of hierarchy of the purposes of training, having noted that the purposes of the highest level of generalization (previous in hierarchical system) are strategic for the purposes with the lowest level of generalization, and the subsequent – tactical for previous. Therefore, social whole educations, occupying the top steps in hierarchical system, are characteristics of reference model of the personality and from a position of theoretical provisions of personally focused training direct educational process on performance of such tasks: to help each pupil, considering his experience, to improve individual informative abilities; to help the personality to learn itself, to gain independence and independently to be realized, but

not to form previously set qualities; to promote the maximum identification, initiation, use, of individual (subject) experience of the pupil; to form culture of activity which gives the chance at the personality is productive to build the everyday life, it is correct to define and conduct its lines [16, p. 34].

The analysis of tendencies of development of chemical science and school practice allows to claim that the purposes of chemical education have to be defined with the general laws of the nature, universal norms of humanistic morality and focus training on strategy formation ecologically, ethically and chemically safe behavior of the person in the biosphere which has to be shown in harmonious coexistence with the nature on the basis of understanding of its laws and a correcting of the activity according to them. Considering it, formation humane ecologically has to be the main strategic objective of modern school chemical education and chemically competent creative person who understands life and the nature as the highest values, realizes requirement of preservation of the biosphere as an indispensable condition not only existence, but also development of humanity.

Reflecting specifics and possibilities of the maintenance of a subject, strategic objectives of chemical education are transformed to the constructive purposes which are directed on assimilation by pupils of all components of the content of education. Have to be such constructive purposes: formation of scientific outlook and its chemical component; providing and assimilation of norms, rules and strategy ecologically, ethically and chemically safe behavior in environment and readiness for its active protection; formation of a conscientious attitude to the health and health of other people as highest social value; disclosure of valuable potential of chemical knowledge; formation of interest in chemical science and methods of scientific knowledge.

The constructive purposes are transformed to hierarchies of the purposes of school chemical education in quick, educational and informative, and materialize in real process of training, in specific conditions of a class. The operational purposes are formulated, proceeding from the general requirements to training, education and development of pupils at modern school, considering possibilities of the maintenance

of a training material and have to be directed on, that the pupil: 1) learned to see genetic linkages between chemicals, communications between live and inanimate nature, activity of the person, natural and social processes; 2) applied theoretical knowledge and abilities, chemical methods of scientific knowledge to generalization, systematization, a specification of theoretical ideas, forecasting, designing of models and use of them, planning of experiment and a pilot study of objects of the nature, decision-making and estimated judgments, vigorous nature protection activity; 3) was able to connect the knowledge got at a lesson with everyday life, to use different sources of information and to estimate reliability of chemical and ecological information; 4) understood value in human life of the nature and healthy active lifestyle; realized a place of the person among the nature and its influence on habitat, own health and health of society; showed interest in wildlife and was respectful to it; was in harmony with the nature, other people, myself.

As for differentiation of the purposes of training of chemistry, it is caused first of all by profiles of high school. In classes and schools of a humanitarian profile tasks of training include disclosure of a role and place of chemistry in formation of a natural-science picture of the world, in cultural life of society, the humanistic aspect of chemical science is emphasized. The purposes of training of chemistry in classes of a natural-science orientation provide profound studying of theories and a concept, strengthening's of attention to practical aspect of a subject, purposeful preparation for continuation of education in higher educational institutions of the corresponding profile. In physical and mathematical classes the mathematical component of chemistry as exact science amplifies. At the general education direction concentric is more detailed and with some additions questions which were studied at the main school (7 – 9 classes) reveal.

Besides, the purposes of training of chemistry have to be opened not only in terms of activity of the teacher, but also in terms of activity of school students. For this purpose the educational and informative purposes appear at pupils in the form of educational and informative tasks. Inclusion in educational process of such tasks and the purpose of the subject content of education taking into account factors of internal

and external appeal of the purpose of training brings the pupil out of limits of a subject and leads to establishment of personally significant communications with other educational branches which define integrity of the content of its education by it.

Appeals of the results programmed by the teacher define the motivating character of the purposes for the pupil: the appeal and the importance of results to the personality is higher, the motive will be stronger. Internal appeal arises when result: provides independence of cerebration; opens a way of own development; provides self-expression; causes content from correctly performed task; satisfies need for self-realization; creates feeling of own value. External appeal arises when result: allows receiving authority on group; increases prestige; ensures personal and public security; increases possibility of social and psychological contacts; provides material welfare and social recognition. And as a basic need of the pupil at lessons of chemistry is the knowledge of the world of substances and reactions and the statement of this world, of educational activity which provides this knowledge, the powerful source of internal motivation is put [13, p. 7].

Finishing consideration of the purpose and tasks of school chemical education, once again we will note that the purpose is considered as predictable result. If the purpose is formulated diagnostic, all course of education can be guided by its signs as on a standard. Thus the result reached by pupils at each grade level is compared to reference signs of the formulated purpose, that is continuous control of level of advance of pupils to the outlined purposes which is followed by the corresponding correction of the course of training [12] is exercised. For this purpose in the training programs in chemistry approved by the Ministry of Education and Science of Ukraine not only the maintenance of a training material is defined, but also the main reference requirements to educational achievements of pupils on each subject are formulated. In these requirements are indirectly reflected key competence of pupils in ways of actions in different informative levels: the pupil calls, gives examples, describes (initial level, recognition); distinguishes, illustrates, works out formulas and the equations, directs definition (the average level, understanding); explains, calculates, characterizes, classifies, uses, draws conclusions (sufficient level, skills); proves,

analyzes, predicts, establishes connection, states judgments, estimates (high level, transferring of knowledge). The list of such requirements will focus the teacher on achievement of the purpose of training in each subject of the program, will facilitate planning of the purposes and tasks of lessons, and will give the chance to use adequate methodical approaches to carrying out studies, the current and thematic estimation [17, p. 7].

For an assessment of productivity of realization of the purposes of education and development in the course of studying of chemistry we consider it expedient to add to the considered requirements such indicators: formation of ecological and chemical knowledge, abilities, norms of ecological and ethical behavior, valuable orientations of common cultural, ecological and humanistic character, interest in environmental problems, social activity, the developed ecological culture, positive personal qualities, competence of pupils of questions of improvement of a state of environment.

Our further researches we see in development innovative – ecological and humanistic – essence of the maintenance of a school course of chemistry on the basis of a definite purpose and tasks of modern school chemical education.

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Роман С. В.

Мета і завдання сучасної шкільної хімічної освіти

Метою сучасної шкільної хімічної освіти є формування гуманної екохімічно грамотної творчої особистості, яка розуміє життя й природу як

найвищі цінності, усвідомлює потребу збереження біосфери як неодмінну умову не тільки існування, але й розвитку людства. Для конкретизації визначеної мети адаптовано підходи вчених до принципів цілепокладання, а також сформульовано додаткові принципи цілепокладання, до яких ми віднесли: принцип діалектичної суперечності мети (єдності потреб суспільства й інтересів особистості, громадських запитів і самореалізації школяра); принцип детермінованості цілей сучасними цивілізаційними викликами, зокрема духовною кризою й екологічною нестабільністю у світі; принцип можливого прогнозування цілей розвитку особистості школяра на засадах сталого розвитку людства та «зеленої хімії». Сформульовано цілі сучасної шкільної хімічної освіти в контексті загальних дидактичних цілей (освітні, виховні, розвивальні), а також відповідно до ієрархії цілей навчання у двох аспектах (стратегічні, тактичні та оперативні цілі; соціальні цілі, цілі освіти конкретного навчального закладу, цілі вивчення окремих предметів, розділів, навчальних тем, уроків). Вони, своєю чергою, визначатимуть сучасний зміст, структуру, динаміку й реалізацію використаних методів, технологій і засобів навчання хімії.

Ключові слова: мета, принципи цілепокладання, ієрархія цілей навчання, формування еколого-гуманістичних цінностей, шкільна хімічна освіта.

Роман С. В.

Цели и задания современного школьного химического образования

Цель современного школьного химического образования – формирование гуманной экохимически грамотной творческой личности, которая понимает жизнь и природу как наивысшие ценности, осознает потребность сохранения биосферы как непременное условие не только существования, но и развития человечества. Для конкретизации указанной цели адаптированы подходы ученых к принципам целеобразования, а также сформулированы дополнительные принципы целеобразования, к которым мы отнесли: принцип диалектического противоречия цели (единства потребностей общества и интересов личности, общественных запросов и самореализации школьника); принцип детерминации целей современными вызовами цивилизации, в частности духовным кризисом и экологической нестабильностью в мире; принцип возможного прогнозирования целей развития личности школьника на основе методологии устойчивого развития человечества и «зеленой химии». Сформулированы цели современного школьного химического образования в контексте общих дидактических целей (образовательные, воспитательные, развивающие), а также в соответствии с иерархией целей обучения в двух аспектах (стратегические, тактические и оперативные цели; социальные цели, цели образования конкретного учебного заведения, цели изучения отдельных предметов, разделов, учебных тем, уроков). Они, в свою очередь, должны определять современное содержание, структуру, динамику и реализацию использованных методов, технологий и средств учебы химии.

Ключевые слова: цель, принципы целеобразования, иерархия целей обучения, формирование эколого-гуманистических ценностей, школьное химическое образование.

Information about the author

Roman Sergey Volodymyrovych – doctor of pedagogical sciences, professor of chair of laboratory diagnostics, chemistry and biochemistry, SE “Luhansk Taras Shevchenko National University”. The main scientific interests are concentrated round a problem of formation of ecological and humanistic values in the course of school chemical education.

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