

FORMING OF CONTENT OF DIFFERENTIAL TEACHING OF CHEMISTRY IN SCHOOL EDUCATION OF UKRAINE

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Abstract. The article grounds historical and didactical development of method of differential teaching of chemistry in secondary education establishments of Ukraine which is accompanied by serious qualitative changes in respect to forming of content of education and choice of forms and methods of organization of teaching process. The paper exposes the ways of realization of content of differential teaching in comparative aspect with traditional one.

Keywords: differential teaching, stages of forming of content of education, profile teaching, pre-profile teaching, conditions of realization of differential teaching, independent cognitive activity

National school, oriented to the individuality as the most important social value, can create conditions for its development. Achievement of this aim foresees first of all modernization of content of school. New school and education situation, cardinal changes in Ukrainian society favor this achievement.

Human nature of education in Ukraine causes changes of authoritarian model of teaching into individually oriented one. Practically it is realized through differentiation of teaching, which takes into consideration at most as well as age and individual peculiarities of pupils, their mental development, interests, motives and need in their study. As O.I. Lyashenko (2009) determines, at contemporary stage “everyone without exception: scientists, practical pedagogues determine differentiation as the main principle in theory and practice of teaching.”

Our research persuaded us that deep understanding of notion “differentiation” as contemporary basic principle of teaching of chemistry at secondary educational establishments favors opening of its essence in the historical aspect (Loukashova, 2010).

We think that own history in the development of national method of chemistry has the problem of differential teaching, solving of which at the contemporary Ukrainian school

is possible only under conditions of deep understanding of ideas of the past, creative mastering and constructive using of positive experience. We mark that methodological is not worked out enough in national teaching method of chemistry and it is not outlined enough in textbooks and teaching books. O.V. Sukhomlinska (2004) thinks that in the profile differentiation of senior school and academic fundamental and professional mobility for the school is not a new idea and it has its history. Opening the question differentiation of teaching of chemistry in the conditions of reforming of education from historical point of view will give an opportunity to understand: this process “has new colors in the context of education, oriented to education with the child in the centre, which puts individuality with its particular needs and with its own internal world as the highest value of social being” (Lyashenko, 2009). This philosophy itself forms the main principles of individually-oriented paradigm of education, which as O.I. Lyashenko (2009) stresses, became the basic one in the process of transformation of education on the edge of the XX and the XXI centuries.

Our research has the aim: to outline the main directions of forming of content of differential teaching of chemistry in the school education in the system of individually-oriented teaching in the different periods of development of method of teaching of chemistry as science, to determine gained experience and its perspectives.

At the beginning of the 30-th years of the XX century, when Soviet school turned to the class-lesson system, the question of industrial growth and collectivization of country became very actual (Sukhomlinska, 2009). The first place among three factors of educational process occupies content of education, the second place occupies teacher as its transmitter of ideas, the third place occupies pupil which must master strictly emphasized content. Suitable paradigm of education kept till the beginning of the 60-th years of the last century; in spite of the growing meaning of natural and scientific content of school education and the fact that it didn't secure optimum conditions for fulfillment of differential teaching of chemistry, because it was built as one integral part: it is known that all the pupils studied compulsory list of subjects, foreseen by the general teaching plan, and teaching programs. School was obliged to secure as well as comprehensive development for the pupils and to prepare them to work in the sphere of material production or to continue their study at secondary and higher special schools.

So first of all, in such conditions cognitive possibilities of individuality of pupils were smoothed over. One problem has arisen; how, teaching basic chemistry, to take into consideration individual peculiarities of pupils – mental development interests, habits, skills. Solving of it demanded differential approach. Parallel, beginning with the 50-th years of the last century, attention to the developing function of teaching, forming

of independence among pupils and their creative activity has grown. One need has appeared: to direct teacher's functions first of all to forming of comprehensive developed individuality of a schoolchild.

Just under such kind of view it was reformed the education in the 60-th – 70-th years of the last century, it was strengthened the developing functions of chemistry as educational subject, that, favored to raise attention to differential teaching. Historical and didactical analysis of problem convinces us that all this happened thanks to closely connected external (profile) and level oriented differentiation. Concretely, external differentiation was carried out in two directions.

The first direction was connected with the opening of specialized schools and forms. At these schools the subject or the cycle of subject were studied by pupils in a profound way according to the specialized programs. Such kinds of specialized schools at the beginning of the 60-th years of the XX century began to function at some universities (in Moscow, Leningrad, Kiev and in other cities). In general similar schools and forms with profound learning of chemistry were opened not a lot, and they were almost absent in the village. But this direction of differential teaching of chemistry became the most perspective in the period of revival of Ukrainian statehood, when differential teaching became basic principle in the conditions of reforming of national school education of schoolchildren.

The second direction, more mass according to the character direction of differential teaching of pupils, accounting their interests in the limits of secondary educational schools became elective courses. The first elective chemical courses that appeared in the 50-th years of the last century on the initiative of creative working teachers were carried out as out of class courses. So far as in the work of elective courses took part small group of pupils (10-15), the teacher had optimum conditions for organization of cognitive activities of schoolchildren, directed to the development of their creative peculiarity. Specialists of chemical enterprises, scientists, educators of higher educational establishments (universities) were invited to carry out elective courses that in general favored to orientation of pupils on choice of their future professions.

Elective courses began to inculcate beginning with the 7-th form. On the base of experimental research (1963-1966) firstly it was recommended elective courses of two types:

1. additional units and questions to the main course of chemistry (programs for the 8-th – 10-th forms were calculated for 70 hours). Elective courses of this type were inculcated with transition of schools on new programs;
2. special courses that deepened knowledge on chemistry, and more concretely: "Chemistry of metals", "Things and their transformations", "Appropriateness

of chemical reactions”, “Bases of chemical analysis”, “Chemistry of polymers”, “Bases of agricultural chemistry”.

On the first stage of elective teaching schools had the right to bring in elective courses on their own choice to take into account manufacturing encirclement, material possibilities and national peculiarities and so on. Till the beginning of the 70-th years of the last century the general quantity of different chemical courses significantly grew that confirmed the attention of scientists and practical teachers to differential teaching of chemistry.

Since 1971 (with the completion of transition of school on new programs) the list of elective courses was revised, it was reduced their quantity, it was specified their name. It was recommended to study only those courses, where it was approved programs; it was handed out educational and methodical textbooks.

Later it worked out the content of theoretical course for the 9-th form “Bases of general chemistry” and for the 10-th form – inter-subject elective courses “Bases of biological chemistry” and “Bases of electrical chemistry”.

Since 1980 from elective courses “Bases of common chemistry” and “Organic chemistry” (the 10-th from) it was recommended short-termed 35 minutes variants of program. Their using was rather acceptable in little schools with small filling of forms.

Historical and didactic analysis proves that development of method of differential teaching of chemistry has been constantly improved; the programs of elective courses have been repeatedly done over again.

Changes that take place the in the society lead to the fact that the most significant and important man’s qualities in the social life and activity are: initiative character, creativity, communicativeness, flexibility of thinking, ability to cooperate with others, ability to do the choice, to search information and work out it, individual responsibility, ability to change kinds of activities, adaptation and so on.

Content of differential teaching of chemistry is based on the State educational standards. We stress that inculcation of standard doesn’t contradict with the most important principle of educational policy – variation and broadening of opportunities of choice of school and pupil. Standardization of education doesn’t mean its “unification from above”. Standard must not limit, but most probably, support opportunity of wide designing of variation of content of teaching on the level of plan and teaching program.

We can affirm that content of teaching plan of differential teaching is formed with the using of school component thanks to increase of hours of definite educational sphere or branch which is named profile – it gives opportunity to mark the main directions – according to them profiles can be created. Profile subjects determine direction, in the limits of which profile character is carried out. Each of teaching of teaching

profiles is determined as well as of subjects and their content. If the content of subjects of chemistry and biology prevails, we can speak about projecting of chemical and biological profile of natural direction. Profound learning of this cycle of subjects has the aim to prevent narrow specialization, which mostly doesn't correspond to the real needs, interests of senior schoolchildren (rather often they are interested in not one subject but a group of subjects, not one profession but some similar professions). Content of subjects is realized thanks to invariant and variant components of content of general secondary education.

At the same time today the researches of scientists testify to the fact that the content of profile subjects must not differ a lot from the content of basic ones. It is suitable to broaden it under condition if new, not big in volume material can essentially improve logic of teaching of a subject. Forming profile competence needs not only increasing of volume of teaching material but increment of content of profile teaching following definite components – philosophical, methodological, scientific and cognitive, psychological and profile itself.

Now it is marked as the main directions of changes in the content of profile disciplines:

- raise of theoretical level of teaching material, which foresees enrichment and specification of conceptual apparatus, learning of more quantity of laws and appropriateness, raise of level of systematization;
- opening of methodological knowledge, mastery of methods of cognition;
- inclusion to the content of teaching material of tasks that need research activity and directed to the development of special skills, creative thinking of pupils, forming of integral attitude to the process of cognition;
- direction to the professional orientation and preparation for fulfillment of professional activity;
- installation of wide inter-disciplined (inter-subject) connections: for example, exposure in the content of natural and scientific education of humanitarian aspects, objects of humanitarian sciences, first of all man with its values, practical and scientific activity in definite cultural and historical context.

Besides today it is generally determined than the depth of learning of content of teaching material depends not only from quantity of exposed connections among different objects and phenomena, but mostly from independent cognitive activity of pupils.

So it is evident than using different principles of organization of profile teaching content education will form on the base of state educational standards of the next types of teaching subjects as:

- a) basic general educational (non-profile) subject – courses, compulsory for all pupils in all profiles of teaching that envelop definite set of compulsory general

educational subject (chemistry), and also integrated courses: knowledge about society for natural and mathematic or technological profiles, knowledge about nature for philological or philosophical and economical profiles;

- b) profile general educational courses – courses of advanced (profound) level on subject than determine direction of each concrete profile of teaching, compulsory for pupils than chose definite profile of learning;
- c) subject or courses that deepen profile;
- d) elective courses – new subjects or courses that exist in the teaching plan of subjects than secure internal profile specialization, come to the structure of profile of teaching, compulsory for attendance according to the choice of a pupil.

Subject than broad profile must first of all secure practical direction of teaching thanks to integration of knowledge and methods of cognition and their using in different spheres of activity and in the professional one too, which determines by specificity of profile of teaching.

So these subjects are similar to profile ones. Volume of their content must be sufficient for further learning of subject at higher competence on the level of mastering of difficult integrative skills-competences. Content of these subjects must add also by modules that are specially directed to “strengthening” of natural profile. These accents can be foreseen while creating special profile textbooks and methodical recommendations for teachers.

Elective subjects (courses) must take into consideration possible specializations in the frames of direction of teaching. Chemical and biological profile of natural direction can envelop such specializations as: medical, agricultural, pedagogical and veterinary. These subjects must fulfill at least two functions. Some of them present basic disciplines that is basic component of future professional education and favor forming of the elementary practical knowledge and skills in this or that spheres of activity. For the pupils, that chose specialization it would be “Chemistry in everyday life”, “Chemical changes”, “Bases of general chemistry”, “Biological and energetic chemistry”, “Chemistry of environment”, “Chemical professions that need society” and so on. Such kind of courses secure first of all succession between school and university, and secondly, they acquaint pupils with the bases of future professional knowledge (Yuzbasheva, 2012).

In the process of learning of elective courses on chemistry pupil must make sure in the right choice of his professional way, courses must acquaint him with manufacturing and technological demands of profession to man, favor forming among senior schoolchildren professionally important qualities of individuality, stimulate them to self upbringing and choice of profession.

Professionally oriented practice is compulsory one during profile teaching; practice connected with elective courses and favors to mastering of elementary professional skills schoolchildren. It is organized in the proper enterprises, in organizations and establishments and so on.

In the teaching plan of chemical profile it is useful to foresee also subject's elective courses (2-3 hours). It is connected, first of all, with possible change of profile of teaching by pupil, secondly with change of set of subjects, from them it is carried out entry tests to the university, at last, elective courses can be directed to forming of cognitive interests of pupil.

School leaver of the basic school must do responsible choice of profile of teaching on the senior level. Right choice, understanding of this choice, effectiveness of profile teaching is mostly depends on quality of pre-profile preparing at basic school. The main aim of this preparing is exposure of interests, checking up of the possibilities of pupil on the base of learning of wide spectrum of short-termed courses (from 8 till 17 hours) that envelop basic branches of knowledge, give possibility to have conception about the character of professional work of people in the chemical sphere. Individual preparing of each pupil must be carried out in two directions:

1. short-termed elective courses for pupils than envelop the main branches of knowledge;
2. professionally-oriented activity which foresees learning of courses for example "Chemical professions that need for society" and carrying out psychological diagnostics.

Formed in such way content of profile chemical education connected with proper means, forms and methods of teaching must secure general cultural preparing of pupils, development of their intellectual skills and succession of general, professional education and motivated choice of direction of professional education.

To sum up, it is necessary to mention than to our minds contemporary system of school teaching is individually alienated, because:

- A. in the conditions of differential teaching class-lesson system of organization of mastering of knowledge by schoolchildren prevails (lesson – base, the unique form of organization of teaching activity);
- B. assessment of results of educational activity is carrying out only according to the indicators of school progress;
- C. non differential approach to pupils prevails, the same demands are proposed for everybody independently from their skills and peculiarities of individual development;

D. direction of development of cognitive skills of pupils are solving not enough, need for pupils self realization in their professional activity.

In the process of inculcation of profile teaching, based on individually oriented, competence approaches, the most important meaning is organization of teaching activity which foresees: *Dialogic approach*: Base for traditional teaching is explaining and individually oriented-mutual understanding. During explanation we have orientation only for individuality. Form of speaking is monologue; during mutual understanding we have two individualities, two thoughts and dialogue. Explanation is mostly teaching. Mutual understanding is first of all communication, joint work; *Joint work of individualities of process of teaching*: During individually oriented approach has the creation of conditions for mastering of joint experience, when teacher together with pupils determine problems, tasks, project the way of decision, orienting to their own real needs, supporting constant activity and joint activity.

So carried out analysis gives the possibility to determine some general directions of search in construction of content of differential teaching and ways of its realization among them:

- partial shortening of content of non profile secondary educational subjects that are learnt on basic level, their possible integration (chemistry, physics, biology);
- strengthening of practical, active directed activity of teaching, connection of theoretical knowledge of pupils with their practical needs, search of ways of the widest application of received theoretical knowledge in their practical activity;
- organization and carrying out of psychological and pedagogical activities of schoolchildren, broadening of their professional and labor experience;
- orientation not to piling up of knowledge but to creation of conditions for mastering experience of cognitive activity in professional sphere;
- integration of establishment of general education with establishments of professional education, additional education of children for broadening of spectrum of educational services and choice done by the pupils of their professional activity;
- essential shortening of teaching according to class-lesson subject system.

Dominating meaning has such methods as independent learning of different sources of information, including use of computer, general and entry lectures; group and pair work, laboratory and research practical courses; seminars, discussions, creative meetings, business games; carrying out of creative contests, preparing of projects and their public defense.

Planning of school education at the senior branch as differential teaching with proper content just now gives us opportunity to reduce teaching “loading” of pupils without loss of level and quality of education; to secure definite level of educational preparing,

professional orientation of pupils, to give everybody the right of choice of profile of teaching, to strengthen independence of their work; to form purposeful desire of every pupil to get definite professions; to take into consideration regional and other peculiarities of activity of school.

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