THE PROBLEM OF STIMULATING FUTURE CHEMISTRY TEACHERS TO THE DISCOVERY OF INTELLECTUAL POTENTIAL IN THE SCIENTIFIC WORKS OF UKRAINIAN AND CHINESE RESEARCHERS

Hou Isyuan
Collaborator of the Faculty of Chemistry, Syntai Academy, China

Today is characterized by the requirements of employers for the high qualification of employees of any industry, including the education industry. The modern teacher must do his job so that it is productive. And this means that such a teacher must fully realize their own potential and teach the students. The issue of teaching chemistry students is too debatable, as students› interest in science subjects has decreased recently. This is due to the fact that professions related to chemical education and technological production on a large scale are disappearing. There is a lack of chemistry teachers in general secondary education institutions, but the number of budget places to study in this specialty in higher education institutions (HEIs) has decreased.

At the same time, we have hope for the revival and renewal of the production sphere in our country, the demand of specialists of chemical and technical profile, the qualitative training of chemistry teachers. According to the results of the analysis of scientific and practical achievements [1–13], the problem of stimulating future teachers of chemistry has affected not only domestic education but also higher education of other countries, including in China. Ukrainian Researchers and Practices, such as O. Gyrya, O. Ivashchenko, N. Chuvasova, T. Shevchuk [1; 9; 12] intensify the issue of creating conditions for the self-realization of chemistry teachers both in the course of professional training and in the workplace. Chinese scientists, such as Dai Tsinbao, Ma Limei, Chen Sinhua, Yang Chenin [2; 10; 13] also work on the problem of preparing a successful chemistry teacher. The scientists such as L. Kalashnik, T. Kostyukova, O. Shatskaya [11] describe the Chinese experience of teacher training. Familiarity with these and other research findings deepens our understanding of possible ways to improve the quality of chemistry teacher training, create favorable conditions for self-realization for them, and encourage future chemistry teachers to become creative at the creative level.

First of all, let us to pay attention to the definition by the scientist N. Chuvasova [9] the concept of «creative potential of future teachers of chemistry and biology» the essence of which is that the personality is a complex, open and self-organized system, the characteristics of which is the ability to creative search, creative self-realization in personal and professional life. Such a definition can be agreed with the addition of the specifics of the professional activity of a chemistry teacher, which clarifies the content of creative potential — the desire to engage in chemistry and pass on the experience to a new generation, knowledge of chemistry and the ability to solve problems, personal traits like perseverance and self-knowledge, ability to chemical experiments, caution and vigilance in handling reagents.

In our understanding, the term «intellectual potential of a chemistry teacher» is a prerequisite for explaining the meaning of the term «creative potential of a chemistry teacher.» However, there is an opinion by S. Efimenko [3] that intellectual-creative potential is an integrated quality of personality, which reflects the possibilities of actualization of internal resources of the individual in productive creative pedagogical activity and potential ability to intellectually-creative professional self-development. According to the author, this concept is characterized by the ability of the teacher to produce new ideas, navigate a fast-paced information environment and independently come out of non-standard situations and solve problems creatively. The structure of the intellectual and creative potential of the teacher consists of components (motivational, intellectual, creative, cognitive, emotional-volitional, personal) and their indicators. In general, it can be considered that the intellectual and creative potential of the teacher is a set of motivational, intellectually creative, cognitive, emotional-volitional, personality abilities of the personality.

Let us also mention the case of the existence and use of the term «spiritual potential of the teacher» (O. Haustova, L. Khomich) [6; 7]. There is also an opinion on the importance of developing the spiritual capacity of the teacher for the creation of a humanistic society as a whole and a harmonious teaching staff. L. Khomich proposes to provide the spiritual development of the teacher as follows. 1. Creating a situation of choice of alternative curricula and programs for the student to accept the content of a particular program, interested him. 2. Use of innovative forms of organization of activity in the educational process, including creation of pedagogical and creative workshops, problem groups, which include students of all courses, as well as research laboratories for conducting experiments on psychological and pedagogical problems. 3. Formation of a high professional culture of communication through which cooperation and partnership should be developed. 4. Familiarization of the future teacher with his individual characteristics is required in the classes of general psychology and psychodiagnostics, focusing on drawing his own psychological portrait. 5. Aesthetization of the process of teaching students in the HEI, which is oriented to the use of forms and methods that contribute to the formation of pedagogical culture of the future teacher of arts.

In the scientific literature, we find at least another interesting idea. Researcher O. Haustova [6] in the practice of postgraduate education combined the idea of developing the spiritual potential of teachers with the use of information

and communication technologies (ICT). ICT tools have been used to prepare (create or select) multimedia presentations and video materials for use in educational work with schoolchildren, and are divided into such features as: 1) presentations and videos aimed at inspiration, relaxation, creative stimulation of imagination; 2) presentations that have ethical, aesthetic and theoretical-pedagogical content. These presentations are divided into presentations-examples for creative activities of teachers to create similar materials for students; and presentations for teacher education and development; 3) presentations that allow for a corrective effect on teachers› attitudes toward life, themselves and others. The first group of stimulation and relaxation materials is presented with presentations and video materials that depict nature paintings, portraits (photos, videos, works of art), portraits, animations, accompanied by classical music or orchestral compositions. The second group of materials is presented by multimedia presentations, which are based on the principle of simultaneous presentation of information of several plans: educational-theoretical, spiritual-moral, artistic-aesthetic, musical.

The scientist O. Haustova gives the examples of such a combination of multiple content layers in a presentation to work with chemistry teachers in the postgraduate pedagogical process. With the aim of mastering the specifics of the use of art-pedagogical technologies in the teaching of chemistry, their features are illustrated by the example of the presentation «Burning». The artistic and aesthetic background of the presentation are paintings with flames, fire, candles, fire juggling, bonfires and more. The musical background is represented by the Royal Orchestra›s song «Hooked on Bach».

O. Ivashchenko›s study [4] formulates the concept of "future chemistry teachers› readiness to teach students the tasks of solving computational problems". The author examines the readiness of future chemistry teachers to teach students how to solve computational problems as a holistic, stable, multicomponent quality of personality, including fundamental, theoretical, practical and methodological knowledge, professional and psychological and pedagogical skills, experience. It names such components of the stated readiness as: motivational, substantive and procedural. The criteria for determining the levels of students ‹readiness for teaching students of solving computational problems were: students› attitude to teaching students to solve computational problems in chemistry, students ‹knowledge of teaching methods of students solving computational chemical problems, students› ability to teach computational problem solving students in chemistry.

Within the study, it should be noted that the willingness of future chemistry teachers to teach students how to solve computational problems has the implication of the formed intellectual abilities — to analyze, compare, summarize, draw conclusions. It is these abilities that underpin correct calculations and produce productive results.

Scientist T. Shevchuk [12] states that a chemistry teacher should be able to work with scientific and methodical literature and other information sources. To do this, in the student›s years of study, the future teacher must master a foreign, preferably English, language for free translation of chemical information, methods of teaching material, to communicate with colleagues from other countries. Also important is the ability and knowledge of the techniques and techniques of chemical experimentation, as well as the method of preparation and use of virtual chemical experiment. The future chemistry teacher should be ready to teach such disciplines as: chemistry teaching methodology, chemistry history, extracurricular work and elective chemistry classes, chemical problem solving methods, all chemical disciplines, industrial practice at school, teaching practices in engineering and technique chemical experiment and the methods of teaching chemistry. It should be ready to: 1) perform a chemical experiment and prepare a virtual version; 2) studying historical data and developing scenarios for making presentations; 3) correction of existing and development of new curricula for elective courses and scenarios for extracurricular activities.

Chen Sinhua [10] describes the requirements for chemistry teachers who have to study curriculum standards in good faith, integrate curriculum concepts, understand the chemistry knowledge system, and create the correct curriculum concept and teaching concept. They should organize the content of the training, teach students to track the process of obtaining chemical knowledge, refine the basic concepts and methods of chemistry, develop the ability to think chemically, and discover the value of chemical knowledge. And also to master the level of students› education, the foundation of abilities, the psychology of learning, cognitive style, the wrong conception, difficulties in learning and the effects of learning.

Chinese scientists Ma Lymei and Yang Chenin [13] propose to improve teaching practice, to enable students to learn problems in practice, to generate problems and to solve problems with the guidance of teachers and their own thinking, and to turn teachers into reflective practitioners before starting work. Strengthening deep communication and collaboration with a practical base to transform theory and skills into real teacher behavior.

The conditions of increasing the effectiveness of vocational training in the development of creative potential of future teachers of chemistry and biology, given by N. Chuvasova [9], are also common for the training of teachers in various fields. Think of them as such that: increase: positive motivation (presence of persistent cognitive interests; presence of cognitive need); self-management of the learning processes and successful formation of the knowledge system (formation of intellectual skills related to the processing of the obtained information; formation of skills of speech and mental activity), pedagogical and educational environment (ensuring cooperation and co-creation of the teacher and students; situations of success and psychological comfort of each student; stimulation of self-improvement, self-criticism, self-confidence). At least, the positive thing is that such conditions are universal for teacher training in

various fields. However, despite the fact that chemistry and biology are related to the natural sciences, the teaching of chemistry teachers has some specificity, as well as the teaching of biology teachers. Therefore, in the study, we do not lean towards such a combination of the terms «chemistry teacher training», «biology teacher training».

The authors of the article A. Kaspersky and O. Kuchmenko [5] give the theoretical and practical importance of chemistry in the preparation of technology teachers in HSE. Ideas of integrating the disciplines of chemistry and physics are expedient, which is explained not only by the limited educational time for their study, but also by the needs of in-depth knowledge of the mechanisms of processes and phenomena, of generalizing the material and making relevant conclusions. Important points are finding new approaches to the organization of individual and independent work of students, opening opportunities for creating an atmosphere of their creative self-realization. We join the opinion of the authors, the essence of which is that the higher the level of intellectual development of students, the higher their initial level of knowledge, the higher and future level of education of such a teacher. The intellectual development of future teachers is facilitated by educational projects, research, presentations, which both shape the intuition and creativity of the teacher. Somewhat trivial and controversial, in our opinion, is the opinion of the authors about the role of testing in improving the quality of students› individual work. We are inclined to use in the process of teaching the chemistry of creative tasks, mastering ICT to improve the work of the teacher.

The same opinion is expressed by the researcher O. Gyria [1] regarding the application of the problem-integrative approach to the preparation of a chemistry teacher in the HEI. We believe that this approach contributes to the formation of students› intellectual skills through many positions. The following items include:

- creation of integrative problem situations in chemistry lessons, setting and solving tasks based on them;
- motivation of cognitive activity of students, stimulation of interest in studying chemistry;
- diagnosis of the results of the educational process.

The function of stimulating future chemistry teachers to discover their intellectual potential is performed by the project method and the solution of creative tasks. For example, L. Chigrina [8] proposes mini-projects for high school students in chemistry, such as: «Nitrates for and against», «Fibers in human life», «Use of plastics», «Alternative fuels». According to the author, the use of this method provides the presentation of educational material at a deeper information and visual levels, contributes to the development of personality in the community. From our own experience we can clarify that it is the project method that develops the intellectual abilities of students and teachers, as the basis of the implementation of projects is the search for intellectual activities of participants in the educational project.

The mentioned author offers the topics of creative works, such as: «Chemistry is…», «Meaning of substances», «Safety», «Substances in our life», which uniquely increase the efficiency of assimilation of educational material due to the image that is of priority importance for a given person . Performing creative work and its positive results increases the score of thematic evaluation, stimulates further creativity, development of imagination, philological or artistic abilities, allows the teacher to enjoy a purely aesthetic enjoyment of the work of students.

Dai Tsynbao [2] There are several methods commonly used by teachers: teaching, discussing, experimenting and interviewing. When teaching in the classroom, teachers should choose appropriate teaching methods according to the location of the content of the learning and the real situation of the students, as well as stimulate the students› enthusiasm for participation in the classroom. For example, the innate nature of matter in chemistry, teachers can use heuristics to explain; When studying the nature of chemical elements, teachers can use experimental methods, research methods to explain.

O. Shatskaya [11] thinks that distance education in China has many advantages, including: professional training of people of all ages of different social strata, a wide range of disciplines, non-traditional teaching methods (radio, telephone, television classes, Internet, on online discussions), unlimited time (study when there is time), organization of lifelong learning, retraining, additional education, saving money and time compared to traditional training. For China, a country with large territories and large populations, distance education is becoming more widespread and open.

Thus, the scientific works of domestic and Chinese researchers intensify the problem of stimulating future chemistry teachers to discover their intellectual potential through the introduction of active teaching methods, the use of ICT tools, professional development of teachers.

Bibliography

1. Gyria O. Problemno-intehratyvnyi pidkhid do vdoskonalennia metodychnoi pidhotovky vchytelia khimii v pedahohichnomu universyteti // Imidzh. 2013. № 6. P. 3–5.
2. Dai Tszynbao. V sootvetstvyy s kontseptsyei novoi uchebnoi prohrammы metodы povыshenyia pedahohycheskoi sposobnosty prepodavatelei khymyy v srednei shkole // Uchymsia ezhenedelno. 2017. № 6. P. 104–105.
3. Iefimenko S. M. Rozvytok intelektualno-tvorchoho potentsialu maibutnoho vchytelia tekhnolohii u protsesi profesiinoi pidhotovky : avtoref. dys. ... kand. ped. nauk : spets. 13.00.04 «Teoriia i metodyka profesiinoi osvity». Kirovohrad, 2015. 20 p.

4. Ivashchenko O. V. Tekhnolohiia pidhotovky maibutnikh uchyteliv khimii do navchannia uchniv rozviazuvaty rozrakhunkovi zavdannia : avtoref. dys. ... kand. ped. nauk : spets. 13.00.02 «Teoriia ta metodyka navchannia». Kyiv, 2007. 21 p.
5. Kasperskyi A. V., Kuchmenko O. M. Formuvannia fakhovoi kompetentnosti maibutnikh uchyteliv tekhnolohii v protsesi vyvchennia khimii // Zb. nauk. prats Kamianets-Podilskoho nats. un-tu im. Ivana Ohiienka. Seriia pedahohichna. № 20. 2014. S. 21–22. URL: http://journals.uran.ua/index.php/2307-4507/article/view/36796/33022.
6. Khaustova O. V. Uprovadzhennia osvitnikh proektiv u praktyku rozvytku dukhovnoho potentsialu vchyteliv u systemi pisliadyplomnoi osvity. URL: https://virtkafedra.ucoz.ua/el_gurnal/pages/vyp9/haustova.pdf.
7. Khomych L. O. Spiritual Teacher potential — the key to creating humanistic society Professional education: pedagogy and psychology (14). 2012. P. 184–191.
8. Chyhryna L. V. Vykorystannia elementiv produktyvnoho navchannia na urokakh // Tekhnolohii navchannia khimii u shkoli ta ZVO : zb. tez dopovidei Vseukr. nauk.-prakt. internet-konf. za zah. red. T. V. Starova (vyd. 1-e). Kryvyi Rih : KDPU, 2018. P. 78–80.
9. Chuvasova N. O. Teoretychni i metodychni zasady rozvytku tvorchoho potentsialu maibutnikh uchyteliv khimii ta biolohii u vyshchykh navchalnykh zakladakh : dys. ... d-ra ped. nauk : 13.00.04. Cherkasy, 2017. 531 p.
10. Chэn Synkhua. Optymyzatsyia prepodavanyia khymyy v srednei shkole // Podhotovka uchytelei nachalnыkh y srednykh shkol. 2017. № 371 (6). P. 45–48.
11. Shatska O. P. Pidhotovka vchyteliv u systemi dystantsiinoi osvity. URL: http://ea.donntu.edu.ua/bitstream/123456789/11606/4/%D1%88%D0%B0%D1%86%D0%BA%D0%B0%D1%8F.pdf.
12. Shevchuk T. O. Vymohy do pidhotovky vchytelia khimii v umovakh reform suchasnoi ukrainskoi shkoly. P. 284–285. URL: http://library.vspu.net/bitstream/handle/123456789/3923/2018Melitopol.pdf?sequence=1&isAllowed=y#page=283.
13. Yan Chenyn, Ma Lymei. Yspolzovanye pozytyvnыkh metodov dlia podhotovky prepodavatelei khymyy v ramkakh natsyonalnoi systemы kvalyfykatsyonnыkh эkzamenov prepodavatelei // Khymycheskoe obrazovanye. 2017. № 38 (20). P. 46–50.