

FORMATION OF ADAPTIVE SUBJECT COMPETENCIES FOR FIRST-YEAR STUDENTS, FUTURE CHEMISTS: EXPECTATIONS AND REALITIES

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Abstract: The article presents the analysis of the expected and formed subject competencies of first-year students of bachelor degree in the direction of 44.03.01 "Pedagogical education. Chemistry" in the adaptation period of study in the first semester. Organization of a complex system of teaching chemical and methodical disciplines during the first semester of training contributes to the formation of theoretical and applied base of the student for the further formation of a young specialist, future chemistry teacher. This system of training of students contributes to the formation of General cultural (OC), General professional (OPC), professional (PC) and special (SC) competencies in accordance with the requirements of the new level standard. The analysis of the results of the study of the issue of formation of adaptive subject competencies of first-year students in the assimilation of chemical and methodological disciplines is presented. The ranking of competencies according to the reduce of importance for the assimilation of the discipline was carried out by students of 1-2 courses at the beginning of the study of disciplines and at the end of the courses. The factors that explain the results of the analysis of the expected and obtained results on the formation of competencies are identified and new methods of classroom and extracurricular work with students in the process of training and training of a competent young specialist are identified.

The applied nature of the importance of this work is determined by practical recommendations for the formation of the student's basic subject competencies, starting with the adaptation period of the 1st course.

Key words: competence, student, University, chemical education, teacher, practice.

1 Introduction

One of the main aspects of the implementation of higher education is the question of formation of graduates' professional competencies, considered as a certain range of professional issues. Within the framework of professional training of bachelors-students, future teachers of chemistry, the question of theoretical and practical training acquires a special meaning. Practice shows the need to form professional competencies of students, starting with the first classroom lessons, deepening and expanding the full range of acquired and practiced competencies of the future specialist (Baydenko, 2009; Kamaleeva et al, 2016; Tahavieva & Nigmatullina, 2017; Golikova et al, 2015).

The relevance of the topic of our study is determined by the contradiction between the increased requirements for the personality of a young specialist, a chemistry teacher, and the level of professional competence of graduates in accordance with the requirements of potential employers (Lerner, 1981; Zelenko & Mogilevskaya, 2009; Villalobos Antunez & Bello, 2014).

Due to the smooth immersion of school education in the process of implementation of the Federal state educational standard of the new level, adjustments were made to the methodology of University teaching of chemical and methodological disciplines and training of young qualified specialists. These issues were partially covered by us earlier from the standpoint of the system of practices in the training of a student, a future teacher of chemistry. The analyses of the main characteristics of teaching chemical and methodical disciplines to students were made, starting from the 1st semester, at the direction of 44.03.01 "Pedagogical education (Kosmodemyanskaya et al, 2017; Kosmodemyanskaya, 2016). Chemistry", in accordance with the curriculum of training of young specialists by the Federal state educational standards of the 3-rd level (FSES 3+).

Research questions include determining the correspondence between the proposed acquired competencies of professional skills of students in chemical and methodological disciplines and the results obtained by future teachers of chemistry. These research questions include the analysis of the formed competencies taking into account deepening of independent work of students of chemical education in the system "school – bachelor (University) – school".

The purpose of the study is to determine the compliance of the professional competencies of students, future teachers of chemistry, being formed and the formation of competencies as a result of the educational process for the training of young professionals.

The purpose of the first part of the study includes determining the level of preparedness of students of chemical education for professional activities in the framework of the implementation of continuous and variable system of practices, providing competence in future professional life. The aim of the second part of the study is to analyze the existing independent work of students of chemical education in the system "school – bachelor (University) – master (University) – school" to address issues of personnel training.

2 Methodology

In accordance with the aims and the objectives of our study, theoretical and empirical methods were used, including pedagogical observation, ranking, statistical and reflexive analysis in the processing of research results.

3 Results and Discussion

1. In the basis of the solution of the problems of the studied question are the main provisions of the technology of training in the management of educational and cognitive activity and the formation of social and professional competence of a young specialist / graduate.

We have considered the features of the formation of professional competencies of students, future teachers of chemistry, training of students in the direction 44.03.01 "Pedagogical education. Chemistry". At the beginning of the first stage, the features of the formation of professional competencies were studied in the training of 43 students and undergraduates in the master's program "Chemical education" from the standpoint of training practices for 2 years of training (2015/2016 and 2016/2017 academic years). The results of the study contributed to the correction of curricula and methods of classroom and extracurricular work on chemical and methodological disciplines of the 1st course. The analysis of students' work (pedagogical observation, interval and alternative (dichotomous) measuring scales) showed incomplete understanding of the main criteria of the subject competencies of first-year students in the disciplines of "Didactic games in teaching chemistry" and "Introduction to inorganic chemistry" (1st semester). They are basic for further study of chemical and methodical disciplines of training of future teachers.

The analysis of normative documents during the second stage of the study showed that the FSES 3+ defines a new format of competencies, which is not limited by the addition of General professional competencies of the GC (General cultural) and the PC (professional). GC are more unified if compared with FSES 3+. We considered the following competencies: General cultural (GC), General professional (GPC), professional (PC) and special (SC). Analysis of this range of competences that should be formed among the students of 1st semester of 1st year, revealed the following.

1) There is different quantity of the specific competencies required for the assimilation of disciplines of chemical and methodological directions. For example, in the chemical discipline "Introduction to inorganic chemistry" it is expected to develop 6 competencies: 1 competence in the field of GC, GPC and PC in each, 3 competences in SC. Another situation is observed regarding the assimilation of the methodical discipline "Didactic games in the teaching of chemistry" - 13 competencies, which are distributed as follows: GC (4), GPC (3), PC (5) and SC (1).

2) The competencies do not always coincide in the assimilation of these disciplines. For example, this applies to GC and SC.

3) The greatest coincidence in the assimilation of competencies is observed in GPC and PC.

4) In the discipline "Introduction to inorganic chemistry" we note 3 special competence (SC-1, SC-2, SC-3), and in the methodical discipline "Didactic games in the teaching of chemistry" – only one (SC-5).

Thus, at this stage of our study, we note the low points of contact of forming competencies across the whole spectrum of mastering chemical and methodological disciplines by students of the 1st semester of the 1st course.

2. At the third stage we conducted a survey of 2 groups of students of the 1st and 2nd courses of direction 44.03.01 "Pedagogical education. Chemistry" on the ranking of the competencies which are the most important for learning a particular discipline. The study involved 52 students.

2.1. First-year students ranked competencies at the beginning of the course "Introduction to inorganic chemistry" according to the assimilation of the importance for the discipline's study. 33.33% of students put the competence with the SC-1 code in the first place. The second and the third places has the competence of the SC-3 code (23.81 %). The last in the list is the competence with the OC-3 code (42.86 %). The competence of the PC-1 scored 23.81 % for 4, 5, 6 ranges, but can't qualify for these ranges, as the competences of the SC-2, GPC-2, GC-3 scored more votes of students (33.33, 33.33 and 42.86%, respectively).

Thus, the first-year students are guided by special competencies at the beginning of the course "Introduction to inorganic chemistry".

To determine the compliance with the expected results for obtaining competencies, we offered to the 2nd year students who have completed the course "Introduction to inorganic chemistry", to rank the competence (as the significance decreases) for its assimilation. After analyzing the data we obtained the following results. The students determined the competence of the code SC-3 at the first place in importance (26.09%). The second place is at the competence of the code SC-2 (43.48 %). At the third place, according to students, should be the competence of SC-1 (43.48 %). The last in the range are the competencies with numbers of GPC-2 (34.78%) and GC-3 (30.43%).

Thus, analyzing the expected and obtained results on the formation of competencies of students in the discipline "Introduction to inorganic chemistry", we concluded that special competencies (SC-1, SC-2, SC-3), according to students, are the most important. A student with these competencies is able to use the knowledge of the theoretical foundations of the fundamental sections of chemistry, chemical experiment skills, basic synthetic methods of production and analysis of chemicals in professional activities in compliance with safety regulations.

2.2. We continued to study the issue of formation of adaptive subject competences of the first-year students in mastering the methodical discipline "Didactic games in teaching chemistry" in terms of ranking of competences (as the importance of the discipline decreases) for its assimilation. Of the 13 competencies, students put in the first place in importance, GPC-2 (26.9 %). In the second place is the competence of GPC-4 (23.1 %). The third line is occupied by the competence of GC-5 (57.7%), PC-1 (23.1%) and PC-4 (15.3%). The special competence of SC-5 was determined by the majority of students (57.7%) for the 8th place. The competence of the GPC-1 is of no interest to students who have not determined its importance. A number of competencies is finished with the code GK-2 (26.9%) – the 13th place in importance.

To determine the compliance with the expected results for obtaining competencies, we offered the 2nd year students who

have completed the course "Didactic games in the teaching of chemistry", to rank the competence (as the significance decreases) for its assimilation. After analyzing the data we obtained the following results. Of the 13 competencies in the first place in importance, students put two-PC-7 and GPC-2 (19.3%). The competence of the GPC-2 is also in the second place with the same percentage (19.3%) and on the third line, but slightly less than -15.38%. A rank is closed (13th place) by competence of the GK-2 (30,77%) and GC-4 (19,23%). The following competences did not gain majority of votes: GK-5, PC-1, PC-2 and PC-11.

We've analyzed the data of the survey of students of the 1-nd and the 2-nd courses on the expected and acquired during the study competencies in the discipline "Didactic games in the teaching of chemistry." The leading line, according to students, is occupied by the General professional competence of the GPC-2, which allows for training, education and development, taking into account social, age and individual characteristics, including the special educational needs of students. This competence leads in expected and achievable values, and for the 2nd year students it takes the 1st, 2nd and 3rd places (simultaneously). The 1-year students target (leading 2 and 3) on getting general professional (GPC-4), general cultural (GCC-5) and professional (PC-1 and PC-4) competencies. And the issues, related to the ability to organize the cooperation of students, to maintain their activity and initiative, to develop creativity (PC-7), are not considered, by freshmen, although the 2nd year students gave them the 1st (19.33%) place and the 8th (30.77%). Strangely enough, but students paid little attention to the special competence (Sc-5), defining it the 6th (23.07%), 8th (57.7%) and even 11th (19.23%) places. Namely, this competence determines the readiness for the formation and evaluation of personal, metasubject and subject results in the process of learning chemistry in accordance with the new standards.

4 Summary

7.1. While training the students in the direction 44.03.01 "Pedagogical education. Chemistry" the requirements are set for improving the quality and practice-oriented knowledge of future professionals. There is a need for quality chemical education for each student, the need for graduates of this profile to achieve the guaranteed level of training in the discipline that will help them in their future lives (Sagitova et al, 2017).

In the 2016-17 school year, the quality of knowledge of students on the results of the exam in the discipline "Introduction to inorganic chemistry" was 96.2 %, and in the 2017-18 school year is 100.0 %. Analyzing data on test and control works, as well as data on the delivery of laboratory reports for two academic years (2016/2017 and 2017/2018 academic year), we obtain the following results on the quality of knowledge during the current certification. The dynamics of improving the quality of knowledge on control work and delivery of reports by students was 7.69 % (respectively, increasing from 80.77% to 88.46% and from 84.62% to 92.31 %). Positive dynamics (3,84 %) are marked in the results of the students' test works from 92.31% to 96,15 %.

The reasons for improving the quality of knowledge are different and, as our observations on the educational process for two years show, one of the most important reason is a special organization of control of learning. The following forms of current control are planned for this discipline: test and control work. According to the working program of the discipline during the semester, two test works and two control works are carried out. To control special competences (SC-1, SC-2 and SC-3) after each laboratory work all students hand over the work to the teacher, preferably on the same day.

7.2. Currently, classroom and extracurricular learning material on the subject "Didactic games in the teaching of chemistry" involves working on the tasks of an electronic educational resource (EER) of the same name, designed in 2016, at the site of distance learning (edu.kpfu.ru). The first year of testing of the

EER are allowed to make adjustments to the tasks, directed on formation of professional and special competences with students. In the 2017/2018 academic year, the positive dynamics for students who perfectly mastered the discipline "Didactic games in teaching chemistry" (according to the differentiated test) was 11.54%, increasing from 23.08% to 34.62 %. This was preceded by the final work of the control, which also showed a positive dynamics of 12.71 % (from 42.06% to 54.77 %). Creative tasks include work on educational programs in chemistry on the SES and the FSES for the formulation and solution of research problems on the requirements of the FSES. In the course of methodical classroom training, the situations on modeling of cooperation of students for development of their creative abilities and independence are offered.

Thus, the definition of new methods of classroom and extracurricular work on the study of the discipline "Didactic games in the teaching of chemistry" to first-year students for the formation of General professional, General cultural, Professional and Special competencies has its positive results.

Indeed, a good way to check and confirm the validity of various forms of control of the first-year students is the correlation of the results of theoretical and practical works in comparison with other data on the formation of adaptive subject competencies of the 1st-year students.

5 Conclusions

The right choice of optimal forms and methods of teaching chemical and methodical disciplines within the first semester of first-year students allows us to determine this complex as a base for further study of the cycle of chemical and methodical disciplines. The formation of a student, a future competent chemistry teacher, should be focused on the formation of critical thinking and the use of practice-oriented learning with elements of activity, technological and personality-oriented approaches in accordance with the requirements of the new level of standards. The expectations and results of students in the assimilation of specialized disciplines do not always coincide. But the application of a more advanced model of training future chemistry teachers contributes to the formation of not only General cultural and General professional competencies, but, more importantly, professional and special competencies.

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