Journal of the Serbian Chemical Society
JSCS-info@shd.org.rs • www.shd.org.rs/JSCS
J. Serb. Chem. Soc. *88* (7–8) 793–810 (2023)
JSCS–5663
Original scientific paper
Published 6 August 2023

Analysis of the initial education of chemistry teachers and their attitudes towards teaching in the Republic of Serbia

SAŠA A. HORVAT*#, VERA I. POPOVIĆ, DUŠICA D. RODIĆ# and TAMARA N. RONČEVIĆ#

Faculty of Sciences, University of Novi Sad, Trg Dositeja Obradovića 3, 21000 Novi Sad, Serbia

(Received 22 August, revised 2 October 2022, accepted 10 July 2023)

Abstract: This research was aimed to analyse the current state in primary and secondary schools in the Republic of Serbia, regarding chemistry teachers' initial education and self-perceived competencies. As an instrument, a questionnaire of 20 questions was used, which was prepared in the form of a Google questionnaire. The questions were divided into five groups to examine data on the structure of chemistry teachers (gender, age, place and school where they teach), the level of education obtained and the method of acquisition and acquired competencies, and finally the personal opinion of chemistry teachers about the teaching profession, advantages, disadvantages and possible recommendations to his/her students in terms of choosing this profession as a possible career. The questionnaire was sent to 1537 schools and 497 chemistry teachers took part in the questionnaire. The results showed that chemistry teachers are predominantly women, mostly aged 36–55, full-time employed and with an average working experience of over 11 years. Most teachers have appropriate education and acquired competencies. They cite working with children as the biggest advantage of the teaching profession while as the biggest disadvantage, they report a constant increase in the amount of administration from year to year.

Keywords: chemistry education; teachers' attitudes; teachers' competencies, teachers' opinions.

INTRODUCTION

In modern society, the education of young people is experiencing constant changes and improvements in various fields. Teaching relies on professional and personal skills and competencies of teacher and it includes a continuous process of professional development.[1] A teacher is required to constantly learn, develop

* Corresponding author. E-mail: sasa.horvat@dh.uns.ac.rs
# Serbian Chemical Society member.
https://doi.org/10.2298/JSC220822039H

and follow modern innovations and acquire new knowledge and skills. His/her specialization will last throughout their working life. Therefore, modern society needs to successfully support students – future teachers in the learning process to be successful in adequately responding to new requirements and accepting new quality standards. Professional development helps, not only the novice teachers but also those more experienced, to learn new strategic endeavours, which improve the success of students in the process of education and the work of teachers in professional engagement.[2,3]

Chemistry teachers' competences should be obtained through initial teacher education at chemistry education faculties and through continuing professional development. Competencies are a complex combination of knowledge, skills and value judgements needed to perform activities in the classroom.[4,5] They include cognitive and practical skills as well as abilities, experiences, strategies and habits, but also emotions, motivation, *etc*.[3] Due to the complexity of the teaching process, in addition to the knowledge of the scientific content of the subject itself, the teacher is required to have developed a Pedagogical Content Knowledge (PCK) skills.[6] The key role of teachers is the development of educational systems and implementation that contributes in terms of the necessary knowledge, better social skills and greater academic success.[2,7] As education and other spheres of society are subjected to constant change, it is expected of teachers to encourage learning, take care of their personal professional development and to be part of an organization that develops and learns.[2] In addition to possessing specific basic skills acquired at the faculty, more flexible, generic and transferable competencies are needed that will make the teacher complete for active and successful work. This implies acquiring knowledge from the educational subjects Pedagogy, Psychology, Methods of teaching and School practice, so-called PPM block in Serbia. The legal regulations currently in effect require practising teachers to have earned 36 ECTS credits based on subjects belonging to chemistry education with intention to the increase to 60 ECTS.[8] The issue of professional development of teachers in recent years inevitably includes providing quality education that would match the new needs of individuals and society. The assurance of quality and success in competitive working conditions is a professionalism based on competencies. Therefore, the constant professional and personal development of the individual is of great importance.[3]

In addition to external factors (school equipment, regulations governing education, *etc*.)[9], internal psychological characteristics have a great influence on how successful the teachers will be in performing their professional activities. Society have to be aware that being a teacher is not only teaching, but also being a role-model to the students because a teacher's human qualities are also important.[10] The most of the chemistry teachers from Slovenia and Finland believe that personal characteristics, interest in chemistry, students' development and enjoyment

of teaching and communicating are the most important attributes of good chemistry teachers.[11] The personal characteristics of teachers are reliable indicators of the success of educational activities. Their work, commitment and behaviour should be an example not only to students but also to the entire society.[3,12,13] A successful teacher is a leader of the teaching process, coordinator and mentor, equal associate, and a person who has high organizational skills and who knows different techniques for establishing contacts and interactions with students, colleagues and parents.[3,14]

The teacher must see himself/herself as a professional guide for young people through the process of upbringing and education to knowledge that is usable in real life.[7] Therefore, the two most important roles of teachers are upbringing and educational role. The teachers are expected to be good managers, to possess the skills to teach, adjust to curricula and student changes and cooperate with their colleagues, or simply to carry out different roles in different contexts.[15–17]

The teacher should not pay direct attention only to the teaching content, but also to the development of students as autonomous individuals. An important aspect of the upbringing role is the moral education of students.[18–20] The teacher, as the main leader of the educational process, is obliged to discover and recognize the needs of students for learning and to help them fulfil those needs through their activities. He/she needs to know students' personalities and to direct their learning toward their capabilities. He/she must be aware of the volume and depth of teaching content and correct them as needed.[14,21]

A teacher must have a clear strategy for leading the class based on respect for students and achieving defined learning goals to be a successful professional.[22] The extent to which he/she will be successful in fulfilling his tasks certainly depends on his/her personality, readiness to perform various roles and desire for continuous professional development.[23] The main goal of professional development is for the teacher to improve himself/herself, develop knowledge, skills and abilities, and improve personal characteristics, as well as his/her work in the classroom, which contributes to more complete preparation of students for life and work.[24]

EXPERIMENTAL

The aim of this research was to find out what initial education chemistry teachers from Serbia possess and what do they think about the quality of their education and teaching as a profession in general and what measures could be taken to improve the current education system.

For this research, the following tasks have been set:

– to determine the state of the personnel structure of chemistry teachers in schools on the territory of the Republic of Serbia,

– to determine how the subjected teachers acquired their competencies and collect their opinions on PPM subjects and

– to analyse their teachers' attitudes about the advantages and disadvantages of the teaching profession, as well as the reasons why they would or would not recommend their students to study to become chemistry teachers.

The instrument

The instrument used in this research was a questionnaire that referred to the personal, educational and professional characteristics of chemistry teachers, emphasizing their initial education, the way of acquired competencies and their opinions about working in a school, attitudes about the quality of initial education, their problems in teaching, as well as the attitude about the chosen profession and whether they would recommend it to their students. The research was conducted in the form of a Google questionnaire and was completely anonymous, and the results were used only for scientific purposes. The questionnaire contained 20 questions. The questions were grouped into several sections represented in Table I. The types of questions were single-answer questions, multiple-choice questions and one open-ended question.

TABLE I. Description of sections of a questionnaire according to number and type of questions

Section	Question numbers	Type of questions
General data on respondents	1–2	Single-answer
Employment	3–7	Multiple-choice (Q4) and single-answer
Initial education of chemistry teachers	8–10	Single-answer
Competencies	11–13	Dingle-answer
Chemistry teachers' personal opinions on their professional vocation	14–20	Multiple-choice, single-answer (Q14,19) and open-ended (Q20)

In multiple-choice questions candidates could mark up to three answers. The questionnaire was created by experts whose scientific field is the methodology of teaching chemistry. The team consisted of three assistant professors and one high-school chemistry professor. Choices to single-answer and multiple-choice questions are proposed in a panel discussion. Some answers proposed for choices in some questions (*e.g.*, 16 and 17) came from personal experience and seminars for the development of chemistry teachers created by the authors of this paper. Seminar participants drew attention to the problems they faced in their everyday life in the classroom. Teachers' responses were statistically processed.

The sample

The research was conducted among chemistry teachers who work in primary and secondary schools in the territory of the Republic of Serbia. Schools from the territory of Kosovo and Metohija were not included in the survey. The questionnaire was sent to the e-mail addresses of the principals of 1078 primary and 459 secondary schools throughout Serbia, who were asked to forward the Google form link to their chemistry teachers. Since there is no reliable data about the number of chemistry teachers in Serbia, the statistical data were calculated based on the number of schools.[8] 497 chemistry teachers took part in the research. They were not asked for any personal information, such as e-mail address or name and surname. The research was conducted during the school year 2020/2021. The total number of schools where the questionnaire was sent and the number of teachers who take part in the survey are shown in Table II.

TABLE II. Total number of schools and number of teachers who participated in the research

Region	Number of schools			Number of respondents
	Elementary schools	High schools	In total	
Vojvodina	344	122	466	227
Belgrade	192	86	278	66
South Serbia	542	251	793	204
In total	1078	459	1537	497

According to the regulations on the appropriate type of teacher education in primary and secondary schools in Republic of Serbia, the educational level of the teachers and the type of school are presented in Table III. Since a part of the teachers work in more than one school, as the primary place of work was taken the workplace with a higher percentage of classes. The table shows that most teachers have the right level of education. As for PPM competences, we see that most of them were acquired at undergraduate studies, but this will certainly be discussed in more detail in the Results and Discussion section.

TABLE III. Educationa level and PPM competencies of teachers according type of school

Education level	Type of schools		
	Elementary	Vocational	Gymnasium
Higher school	16	0	0
Bachelor	176	37	33
Master	121	58	33
Specialisation, Magister, PhD	15	6	2
PPM competencies			
Subjects at Bachelor studies	165	35	25
Subjects at Master studies	32	18	13
Subjects at Integrated studies	13	2	1
Passing the license exam	80	35	22
Further education	24	9	6
No acquired	14	2	1

RESULTS AND DISCUSSION

The results obtained in the survey are presented in the form of a “pie” or “bar” charts.

General data on respondents

This section contained two questions. The first question was about the respondent age. The respondents’ answers are shown in Fig. 1 as follows: the number of chemistry teachers in the Republic of Serbia is very similar between 46 and 55 years old and 36–45 years old, while the smallest number of teachers belongs to the group over 55. The smallest fractions of the teacher population are those who are either at the end of their working career or at the very beginning, while the majority are teachers with some experience.

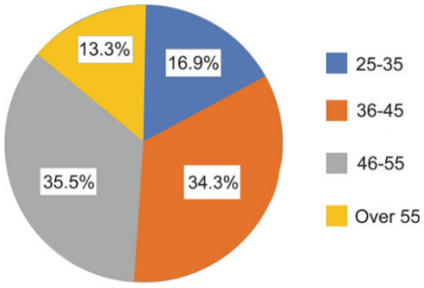

Fig. 1. Chemistry teachers age.

The second question was about the gender of chemistry teachers, and it has been noticed that female teachers are dominantly represented in this profession. Namely, out of 497 respondents, 87.9 % were female teachers. Previous study had shown that gender has no influence on teachers attitudes towards chemistry teaching.[25]

Employment

This section contained five questions. When asked about the place of work, the respondents had the opportunity to choose a city, a village or both. The results show that the majority of teachers work in the city (59.2 %). The least of them work in rural schools (16.3 %), while about a quarter of respondent teachers work in both urban and rural areas to fulfil the working norm (24.5 %).

The fourth question was a multiple-choice question and it was formulated to ask chemistry teachers about the level of the school they work in. Out of a total of 497 respondents, as many as 71.23 % of them stated that they work in primary schools (Fig. 2). This result could be expected given that the largest number of schools are primary schools, and the greatest demand is for teachers in schools of this type. It was noticed that more than 120 teachers, out of 497, work in several schools to gain their working norm which is 20 classes per week.

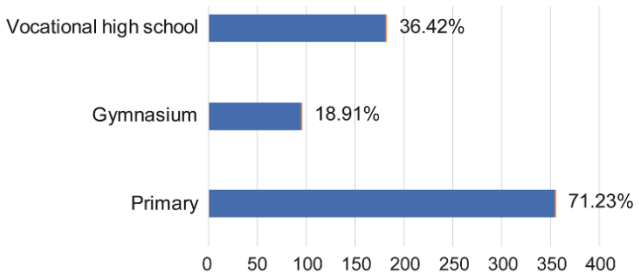

Fig. 2. Representation of chemistry teachers according to the type of school in which they teach.

Regarding the employment status in terms of duration, the respondents had the opportunity to state whether they were admitted to the position of chemistry

teacher in a particular school with a permanent or fixed-term contract. The results showed that 75.5 % of them were hired on a permanent contract.

According to the Rule on the 40-hours working week of teachers and professional associates in high school, the weekly norm of regular classes in high school and vocational and technical schools for chemistry teachers is 20 classes (one class is 45 min). According to the results, the majority of surveyed chemistry teachers work full-time (73.5 %) while only 4.2 % of chemistry teachers work over time. What is concerning is that 22.3 % of teachers do not have full--time or 20 classes per week. The reason for that could be the status of chemistry in the education system because, in The Republic of Serbia, chemistry as a subject is introduced in 7th grade with only two classes per week.

Almost half of the chemistry teachers belong to the group of experienced teachers with more than 10 years of working experience, while the most experienced teachers with over 20 years of working experience represent 27.2 % of the total number of respondents. There are a small number of chemistry teachers who have not yet completed one year of work in the educational profession who are most likely young graduate students (Fig. 3). These results are quite similar to Tomašević and Trivić research.[8]

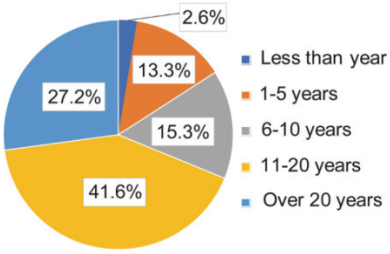

Fig. 3. Representation of chemistry teachers according to their work experience in the field of education.

Initial education of chemistry teachers

The eighth and the following two questions referred to the initial education of chemistry teachers in Serbia. The answer about academic degree of chemistry teachers is presented in Fig. 4.

From the point of view of the educational system, it is commendable that all surveyed teachers have a certain degree, considering that no respondent has declared himself as an undergraduate. Higher school do not exist now in Serbia. They existed before 2005, followed high school and took 6 semesters to their completion. It is the position 5 of European Qualification Framework. The specialist academic studies grant at least 60 ECTS credits after their completion. Before specialist academic studies student must have completed master academic studies. Graphic representation about the educational level of chemistry teachers in certain types of schools is presented in Fig. 5.

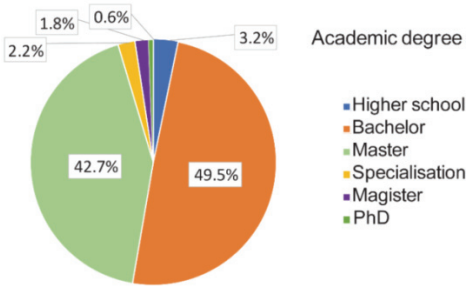

Fig. 4. Representation of chemistry teachers according to their academic degree.

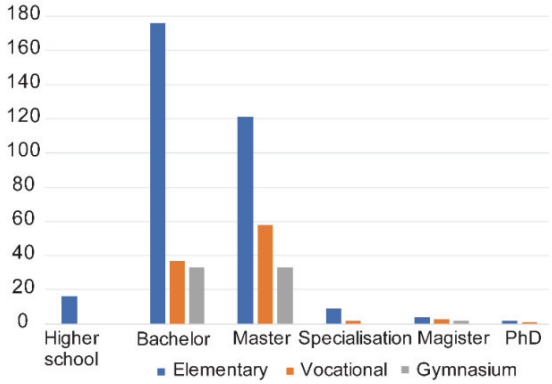

Fig. 5. Representation of chemistry teachers in certain schools according to their level of education.

Since a part of the teachers work in more than one school, as the primary place of work was taken the workplace with a higher percentage of classes. This shows that there is a competent teaching staff at educational positions.

The largest number of chemistry teachers in Serbia graduated from the Faculty of Sciences which has a well-organized program for the education of future chemistry teachers in several university centres. There are 66.8 % of them. Some chemistry teachers graduated at the Faculty of Chemistry which make 20.7 % of respondents, then at the Faculty of Physical Chemistry and the Faculty of Technology or Technology and Metallurgy with 3.6 % of teachers each. The remaining 5.3 % of respondents graduated from undergraduate studies at other faculties. These chemistry teachers completed their studies at the Faculty of Philosophy, or Faculty of Pedagogy or High Pedagogy School (level 5 of European Qualification Framework). They might be the older chemistry teachers who had been studying chemistry when chemistry was subject at these faculties.

When it comes to the Master's degree, the largest number of respondents said they did not have it, as many as 40.4 %. Of those who continued their studies after completing their Bachelor's studies, most of them stated that they had obtained a Master's degree at the Faculty of Sciences, 39.8 %. Three times less

number received their Master's degree at the Faculty of Chemistry, more precisely 13.5 %, and the remaining 6.3 % completed Master's studies at other faculties (Faculty of Physical Chemistry, Faculty of Technology or Faculty of Technology and Metallurgy, *etc*.).

Competences of chemistry teachers

According to the Law's regulations on a PPM program for work in the teaching of the Republic of Serbia, in addition to the teaching area of the subject, teachers should acquire a certain number of ECTS in subjects related to pedagogy, psychology, subject teaching methods and school practice. The chemistry teachers were asked the next question for three subjects: how they acquired the competencies of chemistry teachers for learning and teaching (subjects: Pedagogy, Teaching Methods, School Practice).

Regarding competencies for learning and teaching chemistry, the largest number of chemistry teachers answered that they acquired competencies through subjects within their initial studies (Fig. 6).

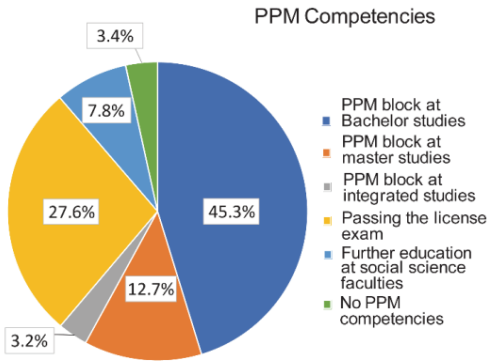

Fig. 6. Representation of chemistry teachers according to obtained competencies.

It is a matter of concern that teachers believe that they acquired competencies by passing the licence exam and through additional education at the Faculty of Philosophy, Faculty of Pedagogy, Faculty of Teaching or Singidunum Faculty. Namely, the chemistry teaching methods and school practice in chemistry can only be obtained at the chemistry education faculties as only these faculties have employees who are engaged in chemical education and who within their education completed courses in all areas of chemistry as well as the pedagogical and the psychological courses. Teacher with no competencies are probably teachers with less than a year of working experience who have not completed their study program in teaching.

It is reassuring to know that the vast majority of respondents believe that PPM block subjects are necessary for a chemistry teacher (93.4 %). Only a small percentage of teachers (6.6 %) believe that this is not the case. As already men-

tioned in the paper, the subjects of this type are certainly needed by future teachers, because thanks to them they acquire all the necessary knowledge and skills to perform the tasks that require critical responsibility to help their students in their development and encourage self-development.

In the process of education reform, the Law on the Basics of the Education System as a novelty introduced the work permit known as license exam, as a condition for the work of teachers in schools. The licence exam checks the trainee's ability to independently perform the work of a teacher after completing the induction program (the duration of the program is one year in a school where the teacher works). The exam is taken in another institution, in front of a committee formed by the Ministry of Education. A candidate with a written preparation of a lesson or activity, or a written essay, approaches the exam. Carrying out the appropriate form of educational work takes one school hour (45 min). The oral part of the exam lasts up to 90 min and consists of the candidate's conversation with the committee about the class held, or the presentation of the activity; solving the specific pedagogical situation and knowing the regulations in the field of education. Success in the exam is evaluated with: "passed" or "failed". Most chemistry teachers who participated in the research have passed the licence exam (80.3 %) while 12.9 % of teachers have completed the internship program and are waiting for an invitation to the exam. At the time of the research, 6.8 % of them were in the process of doing an internship.

Chemistry teachers' personal opinions on their professional vocation

The last 7 questions were about personal opinions of chemistry teachers about their profession, satisfaction with their job, the advantages and disadvantages of a teacher's job and would they advise their students to study chemistry education.

The 14th question was about the possible opportunity to change the job of a teacher. Of the total number of surveyed teachers, 44.7 % enjoy working with children. Teachers' job satisfaction has been recognized as very important.[1] On the other hand, 20.1 % of respondents did not find themselves in the role of teachers and if they could, they would change their profession. 35.2 % of them said that they might apply for another job. Teachers who want to change their profession have work experience between 11 and 20 years and bachelor and master completed studies. This is graphically illustrated in Fig. 7. Similar findings are presented in research conducted in the Southeast part of the USA where 58.7 % wanted to leave teaching after 10 years in the profession.[26]

Those respondents who answered the previous question that they would like to change their profession, were requested to write where they would like to work instead of school. 184 chemistry teachers said that they love the educational profession and would not change their teaching job. However, the largest number of

respondents would still change their job at school for a job in the laboratory, which is 45.88 %. In new research it has found that only a quarter of teachers believe that teacher profession is valued in modern society.[27] The distribution of answers to question 15 is shown in Fig. 8.

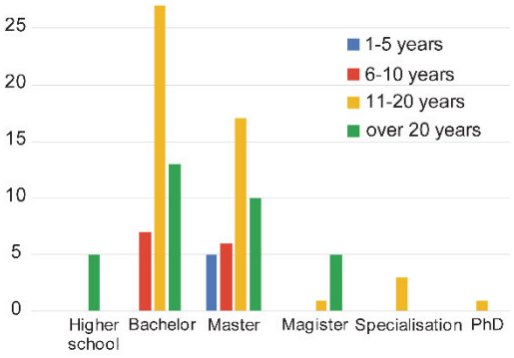

Fig. 7. The level of education and years of working experience of chemistry teachers who want to change teacher job.

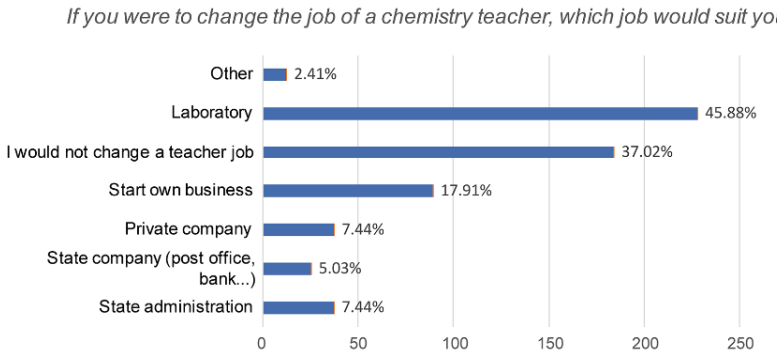

Fig. 8. Representation of chemistry teachers according to a personal opinion about alternative work.

The next two questions were multiple-choice questions about the advantages and disadvantages of the chemistry teacher profession. Answers to questions 16 and 17 are represented in Fig. 9.

The biggest advantages of working in a school, according to the results of the research, are working with children, novelties – the fact that no day is the same as another, and lifelong learning. Bivona claims that teachers need to deal with many challenges during their worktime and that daily routine is not a routine at all.[28] Chemistry teachers stated that they are most concerned about the amount of administration in the teaching profession, which is an integral part of the job. Teachers often feel overloaded with other requirements placed upon them in addition to the teaching they have every day.[29] Teachers spend a greater number of working hours in administrative tasks than in the preparation of teaching

classes, according to a previous survey in the Republic of Serbia.[30] Working with children and novelties as an advantage of chemistry teacher job dominate among teachers aged 36–55 years and with work experience of 10–20 years. On the other hand, teachers cited the lack of laboratory equipment as a big disadvantage of this profession. Chemistry is an experimental science, this is not just a problem for teachers and schools, but the entire educational system of the state. 300 chemistry teachers indicated a low salary as the biggest problem of the teaching profession, while 269 of between them, a small fund of chemistry classes as a disadvantage of this profession. Teachers often fulfil their norm by working in several schools, which requires a high organization of time and schedule of classes by schools. An interesting fact is that a smaller number of teachers stated the need for continuous improvement as a disadvantage. It is commendable that teachers do not see this as a problem but as a need to raise educational activity to the highest possible level. The desire for continuous professional development has been confirmed in previous research in some countries.[31]

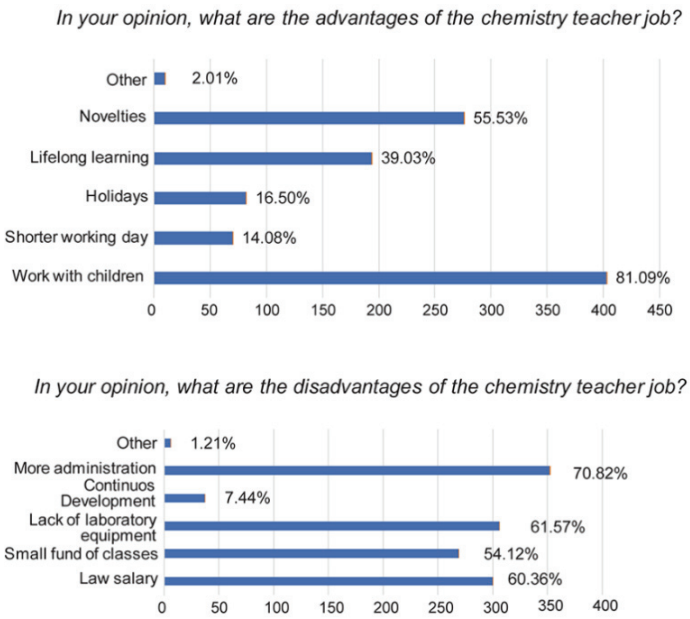

Fig. 9. Representation of chemistry teachers according to personal opinion on the advantages and disadvantages of the teaching profession of chemistry teacher.

As for the shortcomings, the problem with a small salary and a small fund of classes is seen by the same group of teachers. It is interesting that a small salary is not a problem for those under the age of 35. As for the lack of equipment of the laboratory, this is mostly indicated by colleagues with experience over 10

years of and 45–55 years of age. The problem of increasing administration is indicated by all colleagues over 10 years of service and 36–55 years of age.

Question 18 was asked to find out would chemistry teachers work as mentors to students who study chemistry education programs. It was also a multiple-choice question. The majority of respondents answered "Yes, because it is important to share experiences with future chemistry teachers", which is in the interest of the education system and collegiality among teachers. Some teachers saw this as an opportunity for extra money, more precisely, 30.78 % of the respondents. The smallest number would answer negatively to this question (7.44 % of them). Answers to question 18 are represented in Fig. 10. Mentoring is an effective method in the development of pre-service teachers' PCK.[32]

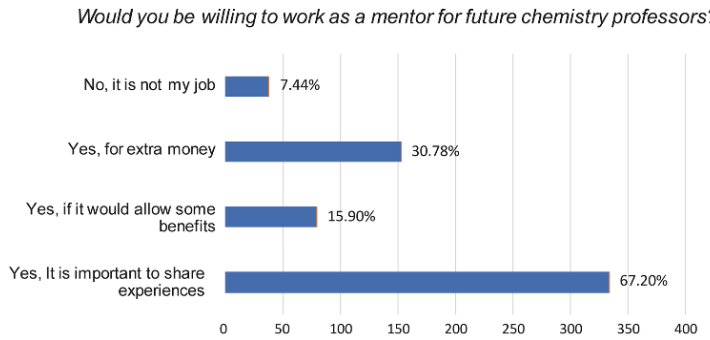

Fig. 10. Representation of chemistry teachers who want to work as a mentor to students.

Questions 19 and 20 asked chemistry teachers about their personal opinions on the recommendation of the teaching profession to students. The first question was about chemistry teachers' recommendations about teachers' profession to their students, and the next one was to write a reason for their answer. Distribution of answers is shown in Table IV.

TABLE IV. Distrubution of answers on question 19: "Would you recommend your students to be chemistry teachers?"

Yes	No	Maybe
34.5 %	24.3%	41.2 %

The results of this study are in line with the results obtained in a study in Australia where almost 35.4 % of respondents would recommend teaching as a career.[33] The reasons for such answers were explained in question 20. Those teachers who answered "yes" to the previous question to recommend the job of a chemistry teacher, cited the following: "Working with children is beautiful, creative and dynamic"; "chemistry is an important science that gives us constant acquisition of new information"; "chemistry allows us to observe the world with

different view and understand the processes that take place around us every day"; "teachers job provides the opportunity to participate in other people's progress and development as a person, as well as the opportunity to transfer knowledge and skills to younger generations". In other words, teachers who would recommend chemistry teachers' jobs to students are in love with chemistry as a science and their profession as chemistry teachers. A group of teachers who stated that they would not recommend their students to work at school explained the answer through the following statements: "Students do not want to study natural sciences, and generally there is no one who could recommend a job as a chemistry teacher"; "there is more and more administration, the work does not end with the bell, but continues at home"; "for the number of tasks required by this job the salary is very small"; "the profession is not valued enough in society"; "the faculty needed for this job is difficult and the job is difficult to obtain"; "a small norm of chemistry classes concerning other subjects that are studied four or five times a week and disparagement not only by students but also their parents"; "lack of laboratory equipment, no room for improvement regardless of the length of service". The answers that the respondents wrote as a reason why they would not recommend teaching profession to their students is in a line with a general opinion about the shortcomings of this profession, regardless of all the advantages of this job. The reasons are also in line with previous research.[33] The third group consists of those teachers who cannot say with certainty whether they would recommend the job of chemistry teacher to their students. They explained their answer in the following ways: "I would recommend this job only if the position of educators changes in society, if conditions improve in all schools, if they provide a sufficient norm of classes, otherwise the job is unprofitable"; "Only if they are ready to work with children, I would recommend the job of a teacher, but some other subject because chemistry is a very complex science". This group of respondents includes those teachers who love their job and the science they do, but would only recommend the job of a chemistry teacher if most of the shortcomings are eliminated.

CONCLUSION AND IMPLICATIONS

The conducted research was aimed at the analysis of the initial education of chemistry teachers and their attitudes towards the teaching profession in the territory of the Republic of Serbia. However, the key findings of this study can be summarized in next points. The number of female chemistry teachers were higher than male teachers. Mid-career teachers are the most respondents and they work in primary school. Three-quarters of respondents are indefinite-term employed and the same number are provided with a full-time job. In the part where the data on employment were examined, the result was obtained that in Serbian schools, those teachers who have at least 10 years of working experience in the field of

education are mostly employed. According to the questionnaire results, the chemistry teachers in Serbia have competence in the necessary qualifications in terms of academic, social, and personality traits. The largest number of chemistry teachers obtained their Bachelor's degrees at the Faculty of Sciences and most of the teachers have passed the professional exam.

In the fifth and last part, the personal opinion of the teacher on the teaching vocation was analysed. The results of the survey led to the following finding: most of the surveyed teachers love their job and would not change it for someone else, while the minor group of teachers said that they would change their job if they had the opportunity, giving the work in laboratories as an example of what they would rather do. Teacher competencies are the key to the practical application of a safe and efficient teaching process. Students' positive attitudes towards chemistry and their motivation to learn and provide appropriate feedback to learning activities significantly depend on how teachers have influenced them.[34] Therefore, it is necessary to deal as much as possible on the issue of initial education of future teachers and the implementation of activities for their personal and professional development.

Perceptions of the status of the teaching profession have changed, and accordingly, the former importance of the teaching profession has disappeared.[35] Some chemistry teachers have specified that factors such as enjoy teaching, love of children, being a teacher is a dream job, and the fact that teachers' working conditions are more comfortable than many other professions are effective in the choice of teaching. The biggest disadvantage of this job are the growing demands of the administration, which takes up too much free time, low salaries, poor position of teachers in society and a small number of classes. When asked if they would work as mentors to students who come to practice at the school where they work, most teachers said that they would be very happy to do so, because in that way they pass on their own experience to younger colleagues.

Despite all the shortcomings of the teaching profession, teachers are a pillar of education and progress in a country. For that reason, joint efforts are urgently needed to develop teachers' competencies and obtain resources and practical equipment to create a scientifically literate society in Serbia.

Acknowledgement. The authors acknowledge the financial support of the Ministry of Education, Science and Technological Development of the Republic of Serbia (Grant No. 451-03-9/2021-14/200125).

ИЗВОД

АНАЛИЗА ИНИЦИЈАЛНОГ ОБРАЗОВАЊА НАСТАВНИКА ХЕМИЈЕ И ЊИХОВИХ СТАВОВА ПРЕМА НАСТАВНИЧКОМ ПОЗИВУ У РЕПУБЛИЦИ СРБИЈИ

САША А. ХОРВАТ, ВЕРА И. ПОПОВИЋ, ДУШИЦА Д. РОДИЋ и ТАМАРА Н. РОНЧЕВИЋ

Природно–математички факултет, Универзитет у Новом Саду, Трг Доситеја Обрадовића 3, 21000 Нови Сад

Ово истраживање је рађено с циљем да се сагледа тренутно стање по питању наставника хемије који раде у основним и средњим школама на територији Републике Србије. Као инструмент је коришћен упитник са 20 питања, урађен у форми Google упитника. Питања су подељена у пет група с циљем да се испитају подаци о структури наставника хемије (пол, старосна доб, место и школа у којој раде), стеченом степену образовања и начину стицања, стеченим компетенцијама и њиховом мишљењу о наставничком позиву, предностима, манама и препорукама младима за избор наставничког позива. На упитник је одговорило 497 наставника. Према добијеним резултатима међу наставницима хемије доминирају особе женског пола, претежно старости 36–55 година, запослене на неодређено радно време и с просечним радним стажом преко 11 година. Већина наставника има одговарајуће образовање и стечене компетенције. Као највеће предности наводе рад са децом, а сматрају да је највећи недостатак професије, због којег не би препоручили својим ученицима да се образују за наставнички позив, све више администрације.

(Примљено 22. августа, ревидирано 2. октобра 2022, прихваћено 10. јула 2023)

REFERENCES

1. B. Cristina-Corina, A. Valerica, *Procedia Soc. Behav. Sci.* **51** (2012) 167 (https://doi.org/10.1016/j.sbspro.2012.08.139)
2. D. Popović in *Montenegro in XXI Century — In The Era Of Competitiveness: Education*, P. Vukotić, S. Milić, Ž. Jaćimović, V. Kašćelan, Z. Bogićević, D. Radonjić, R. Šendelj, D. Popović, T., Novović, Z. Minić, K. Popović, V.A., Lubarda, M. Popović, B. Šišević, Z. Kotri, Eds., Crnogorska akademija nauka i umjetnosti, Podgorica, Montenegro, **73**, 2010, 239 (in Serbian) (https://canupub.me/bli3)
3. M. Danilović, in *Proceedings of 6th International Symposium Technology, Informatics and Education for Learning and Knowledge Society,* 2011, Čačak, Serbia, *Tehnologija, informatika i obrazovanje, TIO 6,* Tehnički fakultet, Čačak, 2011, 371.12 (in Serbian)
4. R. Deakin Crick, in *Getting involved: Global citizenship development and sources of moral values*, F. Oser, W. Veugelers, Eds., Sense Publishers, Rotterdam, 2008, p. 31
5. B. Tomašević, D. Trivić, *J. Serb. Chem. Soc.* **80** (2015) 435 (https://doi.org/10.2298/JSC141002121T)
6. L. S. Shulman, *Educ. Researcher* **15** (1986) 4 (https://doi.org/10.2307/1175860)
7. K. Lasić, *Putokazi*, **1**(2019), 157 (in Serbian) (https://putokazi.eu/web/aktualni-broj/)
8. B. Tomašević, D. Trivić, *Chem. Educ. Res. Pract.* **15** (2014) 239 (https://doi.org/10.1039/C3RP00116D)
9. R.R. Edmonds, *Search for effective schools: The identification and analysis of city schools that are instructionally effective for poor children (final report)*, Detroit, MI, 1977 (https://eric.ed.gov/?id=ED142610)
10. N. Oruç, *Int. J. Humanit. Soc. Sci.* **1** (2011) 83 (http://www.ijhssnet.com/journals/Vol._1_No._4;_April_2011/11.pdf)

11. V. Ferk Savec, B. Urankar, M. Aksela, I. Devetak, *J. Serb. Chem. Soc.* **82** (2017) 1193 (https://doi.org/10.2298/JSC161221083S)
12. K. Lasić, *Putokazi* **3** (2015) 101 (in Serbian) (https://putokazi.eu/wp-content/uploads/2015/03/KL.pdf)
13. G. Handley, *Personality, learning and teaching*, Routledge & K. Paul, London, 1973
14. H. Požar, *Sinteze – časopis za pedagoške nauke, književnost i kulturu* **5** (2016) 23 (https://doi.org/10.5937/sinteze0-11315) (in Serbian)
15. G. Đigić, *PhD Thesis*, Faculty of Philosophy, Niš, https://nardus.mpn.gov.rs/handle/123456789/4000 (accessed 28.11.2021) (in Serbian)
16. L. W. Anderson, D.R. Krathwohl, *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives*, Longman, New York, 2001 (https://www.uky.edu/~rsand1/china2018/texts/Anderson-Krathwohl - A taxonomy for learning teaching and assessing.pdf)
17. K. Funda Nayir, S. Cinkir, *Anthropologist* **20** (2015) 1 (https://doi.org/10.1080/09720073.2015.11891718)
18. S. Stojiljković, *Zbornik Instituta za pedagoška istraživanja* **33** (2001) 190 (in Serbian) (https://www.ipisr.org.rs/images/arhiva-zbornika/Zbornik-33.pdf)
19. S. Stojiljković, Z. Dosković, *Zbornik Instituta za pedagoška istraživanja* **22** (1990) 63 (in Serbian) (https://www.ipisr.org.rs/images/arhiva-zbornika/Zbornik-22.pdf)
20. S. Stojiljković, Z. Dosković, *Godišnjak za psihologiju* **4** (2006) 237(in Serbian)
21. D. Ješić, *Časopis za društvene i prirodne nauke* **1** (2010) 195 (in Serbian) (https://www.psihologijanis.rs/arhiva-godisnjak/godisnjak-2005-2006/Godisnjak-Vol-4-No-4-5-%282005-2006%29-237-251.pdf)
22. V. Simeunović, P. Spasojević, *Savremene didaktičke teme: nacrt za savremenu didaktičku koncepciju i strategiju nastavnog rada u osnovnoj školi*, Pedagoški fakultet, Bijeljina, 2005 (in Serbian)
23. S. Stojiljkovic*, Psihološke karakteristike nastavnika*, Filozofski fakultet, Niš, 2012, (in Serbian)
24. E. M.Uslu, T. Özgün, *Research on Education and Psychology* **6** (2022) 68 (https://doi.org/10.54535/rep.1134110)
25. S. W. Wachanga, M. Ngary, D. R. Muchiri, *ZJER* **15** (2003) (https://opendocs.ids.ac.uk/opendocs/handle/20.500.12413/5376)
26. B. Scafidi, *An analysis of the retention rates of Georgia public school teachers. The Governor's Office of Student Achievement* (accessed 30.11.2022 from www.gosa.georgia.gov)
27. *OECD. TALIS 2018 Results (Volume II) Teachers and School Leaders as Valued Professionals* (accessed 02.12.2022 from https://www.oecd-ilibrary.org/education/annex-bmain-breakdown-variables_d1ba43b3-en)
28. K. Bivona, *Teacher moral: The impact of teaching experience, workplace conditions, and workload*, 2002 (accessed 02.12.2022 from http://eric.ed.gov/?id=ED467760)
29. S. Black, *Am. Sch. Board J.* **190** (2003) 36 (https://eric.ed.gov/?id=EJ674597)
30. B. Tomašević, D. Trivić, *Pedagogija* **4**(2014) 605 (in Serbian)
31. D. Sikošek, B. Čagran, *J. Elementary Educ.* **9** (2016) 75 (in Slovenian) (https://journals.um.si/index.php/education/article/view/351)
32. D. Can-Kucuk, S. Gencer, H. Akkus, *Chem. Educ. Res. Pract.* **123** (2022) 599 (https://doi.org/10.1039/d2rp00033d)

33. F. Longmuir, B. Gallo Cordoba, M. Phillips, K.A. Allen, M. Moharami, *Australian Teachers' Perceptions of their Work in 2022*, Monash University, 2022 (https://doi.org/10.26180/21212891)
34. J. Copriady, *Med. J. Soc. Sci.* **5** (2014) 312 (https://dx.doi.org/10.5901/mjss.2014.v5n8p312)
35. L. Hargreaves, M. Cunningham, A. Hansen, D. McIntyre, C. Oliver, T. Pell, *The status of teachers and the teaching profession in England: Views from inside and outside the profession*, The Chancellor, Masters and Scholars of the University of Cambridge, Cambridge, 2007.