



# European Journal of Mathematics and Science Education

Volume 1, Issue 1, 1 - 13.

ISSN: 2694-2003

<https://www.ejmse.com/>

## Assessment of Science Education Teachers' Quality Work

Vyacheslav Viktorovich Utemov<sup>ID</sup>  
Vyatka State University, RUSSIA

Received: March 6, 2020 • Revised: May 11, 2020 • Accepted: June 14, 2020

**Abstract:** The quality of science education teachers' work determines the effectiveness of education and science education programs in many respects. Given that the results of students are not the same for teachers with the same formal characteristics, we formulate the research problem: when assessing the effectiveness of teachers, we can distinguish a system of indicators that affect the effectiveness of education and educational programs. The purpose of this article is to analyze the quality of work of science education teachers in the Kirov region and their teaching practice. The leading research methods in this case are the concept of the third international study of teaching and learning "Teaching and Learning International Survey", collecting data obtained through a questionnaire of science education teachers, analyzing the quality of work and conditions of pedagogical practices, statistical processing of the research results, modeling and conversations with heads of secondary schools and representatives of executive authorities. As a result of a study conducted in 2017–2020, in which 1146 teachers of secondary schools of the European part of Russia took part, including 310 science education teachers, the author of the article found: the workload of a school teacher of science education is 0.65; subjects teachers spend on average 42.2 hours every week to perform their official duties, urban teachers have more work than rural teachers; with age, teachers of science education have a partial redistribution of labor activity from teaching to administrative work; actual teaching takes 53% of working time in the structure of workload for teachers of science education; teachers evaluate the completeness of their knowledge upon completion of training at the level of 38% of the required level for performing labor activities; there is a predominant share of teachers with a moderate level of need for knowledge in most areas of professional development. The results of the study allow us to develop a set of group measures for training and methodological support of science education teachers. These measures should take into account the specifics of workload and the characteristics of professional deficits.

**Keywords:** *Teacher of science education, quality of teachers, age structure of the pedagogical community, working conditions of science education teachers.*

**To cite this article:** Utemov, V. V. (2020). Assessment of science education teachers' quality work. *European Journal of Mathematics and Science Education*, 1(1), 1-13. <https://doi.org/10.12973/ejmse.1.1.1>

### Introduction

Assessing the quality of work of science education teachers allows us to work out optimal solutions aimed at developing the pedagogical community and improving the conditions in which teachers work. The school environment and the conditions of pedagogical work affect the quality of teachers' work. The quality of teachers' work is related to the academic results of their students. Therefore, we can assume that the analysis of the educational environment and the pedagogical practice of teachers will help to assess the quality of work of science education teachers. This assessment can give a forecast of effectiveness of education and educational programs implemented by science education teachers.

It has been found out that external conditions significantly affect learning results, for example, such as well-being, social status of the family, and student communication (Coleman, 1968). The level of government and VIPs influence is high in the sphere of education. Therefore, the possibility of influencing the characteristics of education causes interest in studies of assessing the quality of teachers' work (Popov, 2018). In studies of Sibgatullina et al. (2019), they note that science education is experiencing significant difficulties in its development, due to the age characteristics of science education teachers. In this regard, a comparison of the quality of work of science education teachers with the data on other national education systems and subject areas will make it possible to substantiate measures for the development

**\* Correspondence:**

Vyacheslav Viktorovich Utemov, Moskovskaya str., 36, Kirov 610000, Russia. ✉ [vv\\_utemov@vyatsu.ru](mailto:vv_utemov@vyatsu.ru)



of education (Utemov, 2019). Among the existing international methodologies for assessing quality, the most proven methodology is the TALIS (Teaching and Learning International Survey), an international study on teaching and learning in secondary schools (Ainley & Carstens, 2018). The study has been conducted since 2008. In 2018, 45 countries participated in TALIS. The latest study examined the professional characteristics of teachers, their teaching practices, measures for professional development, job satisfaction, and the school climate. There are debatable issues in the work of the Organization for Economic Cooperation and Development, which conducts the TALIS study (Berkovich & Benoliel, 2018; Gardinier, 2017). In our study, to avoid these controversial issues, we assessed the quality of work of science education teachers based on the materials of the TALIS 2018 international study that we adapted. The assessment was made taking into account the issues that underlay management decisions in personnel policy. So, the study examined the conditions of pedagogical practice, the level of professional education, the system of professional development and support for science education teachers. In the study, teachers of physics, chemistry, biology, anatomy, ecology, and subjects related to them are referred to as science education teachers.

Given that the questions in the study are comparable to the TALIS questions, the answers can be used to compare them with similar indicators of other national education systems.

### Literature Review

The issues of assessing the quality of work performed by science education teachers are rather fragmented in researches.

A study conducted in the United States considers the relationship between teachers' assessment experience and overall job satisfaction (Ford et al., 2018). Researchers are wondering: how to evaluate teachers to support their professional development?

Xuehui (2018) argues that the level and structure of teachers' salaries are not key factors affecting teacher qualifications, and are also crucial for attracting and retaining teachers, which affects the overall quality of education. We can also ascertain the influence of the human capital and working conditions of teachers on the quality of education. So, Marioni et al. (2020) found that teacher working conditions affect student achievements. Researchers Mason-Williams et al. (2020) independently come to a similar conclusion in relation to special education. They note that the working conditions of a teacher are a key factor in retaining a teacher in the profession. Ali (2018) considers working conditions as a factor contributing to the professional growth of a teacher.

But at the same time, there are differences in the level of dependence between conditions for science education teachers. Thus, the relationship between salary and career expectations, assessments in society and career expectations differs among students with different levels of subject knowledge (Han et al., 2018).

Let us divide the assessment of the quality of the teacher's work into his knowledge of the subject and knowledge of pedagogy. We find that the teacher's knowledge of the subject determines his knowledge of pedagogy (Delgado-Rebolledo & Zakaryan, 2020). So, the quality of the teacher's work is more dependent on the level of his subject knowledge.

Researchers pay much attention to the issue of teacher training. Dogan and Yurtseven (2018) conclude that professional learning communities and reform-based professional development have a significant impact on the quality of learning. A study by Fernandez-Fernandez et al. (2016) showed that participation in educational activities of a reflective nature contributed to the professional development of a teacher. This activity means greater dedication and intensity for teachers, but also leads to understanding of their professional effectiveness and control of learning processes.

Mu'in et al. (2018) emphasize that the task of the teacher is not exclusively associated with teaching, which involves planning, implementation and evaluation of educational and methodological work. Teachers are also responsible for their professional growth, for the development and improvement of their pedagogical skills, the development of modern teaching methods that meet existing educational needs and the development of information and communication technologies. Angnakoon and Allen (2016) emphasized the importance of developing teacher training programs, development courses for teachers and school principals. For example, studies by Gil-Izquierdo and Cordero (2018) point out those students whose teachers focus on few teaching methods get better results than those who have teachers using a wider variety of teaching methods.

The self-sufficiency of a teacher is related to the quality of his/her students' training and their motivation. The results of the study by Buric and Kim (2020) show that training quality is positively associated with students' motivation. At the same time, the quality of training is also associated with the pedagogical methods used. For example, the teacher-initiated hand touch on the student's shoulder helps the student concentrate (Heinonen et al., 2020). On the other hand, teacher's workload, collaboration of teachers, and their perceptions of student discipline at school are key factors that influence job satisfaction (Toropova et al., 2020).

If we consider the quality of education through the prism of the student's quality of life (satisfaction with life), then we should mention the study by Cleofas (2020). The author concludes that the student's social interaction in school outside the class is connected with the student's quality of life. In the studies by Keller (2020), one can find a clarification that quality is ensured by the team work of the organization's teachers. Thus, the quality of the teacher's work should be evaluated through his/her work on the organization of extracurricular activities of students.

Other studies examine teachers' satisfaction with their job in combination with other working conditions. For example, they define as such conditions distributed school leadership and professional collaboration (Sun & Xia, 2018; Torres, 2019); level of collaboration between teachers (Madero, 2019); level of satisfaction with working conditions and degree of participation in school decision-making (Brezicha et al. 2019; Price & Weatherby, 2018); self-efficacy, age, gender, school experience, teacher-student relationships (Gil-Flores, 2017).

Oerke and Bogner (2010) in their studies recognize the importance of taking into account the age characteristics of teachers and their impact on the pedagogical process. Some studies describe the ideas of structural limitations (age, disability, ethnicity, and gender aspects) that interfere with teacher careers (Cau-Bareille et al., 2019; Wilson et al., 2006).

Taking into account the age characteristics of teachers is an important component in the management of the teaching staff. So, Zhou et al. (2011) conclude that the motivation for professional development is greatest among middle-aged teachers, with increasing age, motivation decreases significantly.

A number of studies analyze the dependence of the working ability level on the age group. Thus, it was found that 24% of teachers in the younger age group and 49% of teachers in the older age group have a weak level of working ability manifestation, which indicates the need for measures to increase the working ability of teachers (Freude et al., 2005). On the other hand, the experience of individual teachers (special education schools, vocational training institutions, preschool education, etc.) plays a significant role in the quality of work performed (King et al., 2018; Sheridan et al., 2018). An analysis of the age structure of teachers serves as a basis for forecasting the development of the pedagogical community for the regions of the Russian Federation until 2050 (Fedorov et al., 2018). Some studies focus on teachers' assessments according to age, level of education, and subject specialization (Pugach & Utemov, 2016; Utemov & Simonova, 2018).

TALIS has a dominant position in teacher quality studies. TALIS is conducted by the Organization for Economic Co-operation and Development to collect and compare information about teachers and executives in different countries in key areas: training and professional development of teachers, learning results assessment, school management, objectives of pedagogical work and teacher practice, job satisfaction and confidence in professional abilities (Pinskaya et al., 2016). The materials of the international study of teaching and learning for 2009, 2013 and 2018 formed the basis of research in different countries. There are some foreign studies that criticize the TALIS program and analyze the contradictions, existing in the program, regarding the reform of the teaching profession and the way of teaching (Sorensen & Robertson, 2019).

An additional source of increased interest in this issue is the continuing growth in the number of students and teachers in educational institutions in a number of countries (Center for social forecasting and marketing, 2017; Russian Federal State Statistics Service [ROSSTAT], 2016).

Thus, there is a research interest in assessing the quality of work performed by science education teachers. At the same time, the assessment of teachers' work quality is examined in a highly specialized manner (for example, only by age or qualification). Given the inertial nature of changes in the education system, it is necessary to make a comprehensive assessment of the quality of science education teachers' work and their teaching practice to take measures to improve the quality of education.

## **Methodology**

### *Research Goal*

When analyzing the effectiveness of education according to the model of J. Mincer (Mincer, 1958), formal educational indicators are used: the level of basic education and the number of years spent on education. At the same time, the achievements of students are different for teachers with the same values of indicators characterizing their qualifications. A number of studies examine indicators of the quality of teachers' work in the context of their students' achievements. But given the fact that it is impossible to assess cross-country differences and effects in such studies, this approach is characterized as highly specialized. The basis of our study is the assumption that in assessing the quality of work of science education teachers, we can distinguish a system of indicators that affect the effectiveness of science education and implemented educational programs. The school environment and the conditions of pedagogical work should be taken into account in this analysis. In 2018, we completed a study of the age structure of science education teachers, which can become the basis for comparing the educational environment in schools.

In this regard, the aim of the study is to analyze the quality of the work of science education teachers and their teaching practice. The study is based on comparison of data on working conditions, professional education and the development

of teachers, which allows us to develop managerial decisions in personnel policy, in the training and support programs for science education teachers.

To analyze the quality of the work of science education teachers, empirical data were collected through questionnaires for teachers of general educational organizations of various age and service categories. We used modeling and statistical processing of the results of empirical research.

#### *Sample and Data Collection*

Collection, analysis and generalization of the research results are carried out on the basis of secondary schools in the European part of Russia, in both urban and rural areas (2017–2020):

- by questioning 1146 school employees, including 310 science education teachers. Respondents represented 200 schools, including 44% of schools with less than 100 students, 29% of schools with 100 to 500 students, 21% of schools with 500 to 1000 students, 6% of schools with more than 1000 students. The proportion of respondents from schools located in cities is 41% versus 59% in rural areas. The questionnaire included 31 questions on the following key aspects: job evaluation, professional education and development, attitudes and views on teaching and pedagogical practices;

- by analyzing the quality of work of science education teachers and their teaching practice through statistical processing of experimental data. The evaluation results were discussed at seminars and round tables with the principals of secondary schools and representatives of executive authorities in the field of education at Vyatka State University (more than 450 participants).

The study was conducted in four stages.

At the first stage, the state of the problem under study in the theory and practice of assessing the quality of work of science education teachers was revealed. For this, we studied and made analysis of economic and psychological-pedagogical literature on the research problem; analysis of the experience of international studies of education quality assessment.

At the second stage, we developed approaches to a comprehensive analysis of the quality of work of science education teachers and their pedagogical practice, determined indicators of analysis. The discussion of the generalization results was carried out during seminars with representatives of schools and executive authorities in the field of education.

At the third stage, a survey of educational institutions representatives was conducted. Schools were asked to answer a questionnaire consisting of 31 questions. The survey involved at least five school employees, including a representative of the administration, a young teacher and a teacher with many years of experience.

At the fourth stage, we made the analysis of the quality of work of science education teachers by means of statistical processing of experimental data.

#### *Analyzing of Data*

The leading approach to the study was the concept of the third international study of teaching and learning (Teaching and Learning International Survey - 2018). We choose the following research methods:

- monitoring the organizational activities of science education teachers and school employees to work out questionnaires for the survey;
- collection of data obtained through a questionnaire survey of science education teachers and other school employees;
- analysis of the quality of work and the conditions of pedagogical practices of science education teachers;
- statistical processing of research results;
- modeling the structure of the teaching load, the educational structure of working teachers, the structure of actions to improve professional skills of science education teachers;
- conversations with the administration of secondary schools and representatives of the executive authorities in the field of education to discuss the results of the study in order to obtain conclusions that would make it possible to develop balanced measures for training and methodological support of science education teachers.

To achieve the initial goal, i.e. to study the quality of work of science education teachers, we examined in the following areas:

- structure of the teaching load;
- structure of teachers' labor activity;
- structure of teachers' education;

- structure of professional development needs of teachers.

## Results

### *The structure of the teaching load of science education teachers*

To define the structure of the teaching load of science education teachers, we made an analysis of the teaching load share for a teacher in one school subject. So, our calculations show that the average rate of a school subject teacher in one profile is 0.70. Calculations of the average share of the load for science education teachers give us 0.65. For example, the share of the teaching load for teachers of biology and chemistry is 0.6, for teachers of physics - 0.65, and geography - 0.7. It can be concluded that the proportion of teachers working on a single subject rate is extremely small, which means that teachers combine teaching two school subjects.

### *The structure of science education teachers' labor activity*

To demonstrate the structure of science education teachers' labor activity, we compiled an appropriate diagram (see Figure 1). In order to compare the nature of working time allocation, the number of weekly academic hours, the diagram indicated the number of weekly academic hours, which, according to teachers, were devoted to the following kind of activity:

- teaching;
- not related to direct teaching (classroom management, documentation, training students for contests and competitions, working with slow learners, etc.);
- administrative.

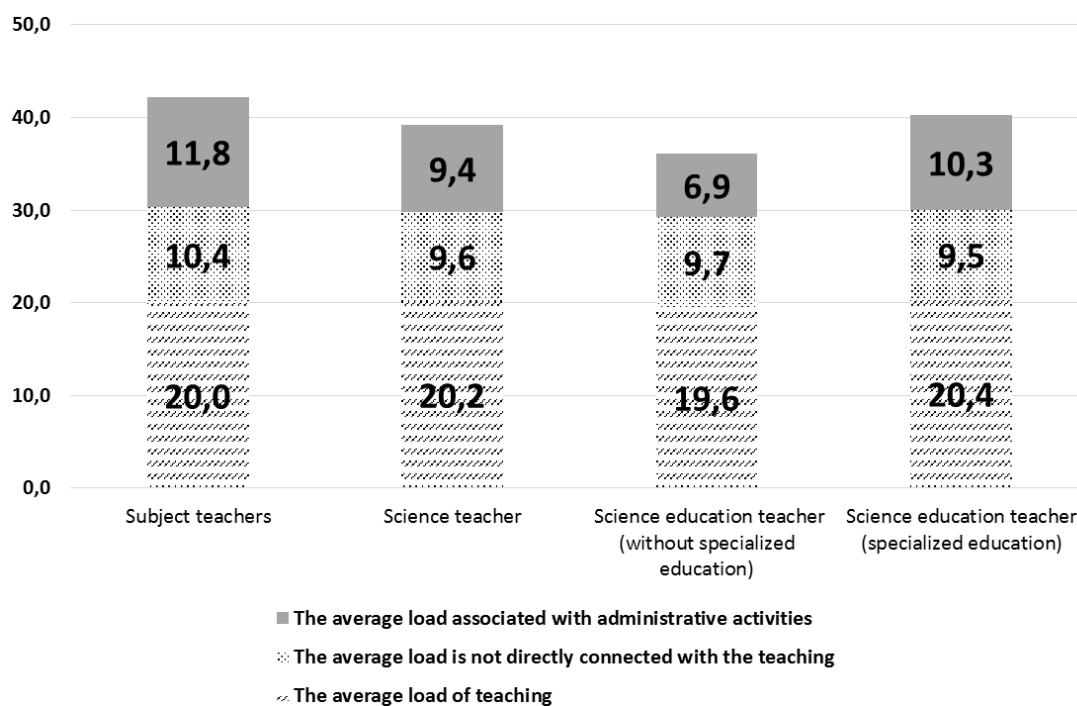


Figure 1. The structure of science education teachers' labor activity taking into account the profile of education (hours)

Note that, on average, subject teachers spend 42.2 astronomical hours per week to perform their official duties, while science education teachers work 3 hours less (39.2 hours respectively).

The teaching load of the subject teacher and science education teacher is approximately the same (20 and 20.2 hours, respectively). On the contrary, the administrative load for teachers of science education is 2.4 hours less than for a subject teacher on average (9.4 and 11.8 hours, respectively). Similarly, the load, not related to direct teaching, is also lower for science education teachers (9.6 and 10.4 hours, respectively). Thus, in comparison with subject teachers, teachers of science education have decreased workload not related to direct teaching. It is interesting to note structure of science education teachers' labor activity, depending on the profile of education. So, a teacher without specialized education works 4 hours less (36.1 hours versus 40.3 hours), with 3.4 hours less administrative work. It can be assumed that science education teachers without specialized education often combine this work with the other one.

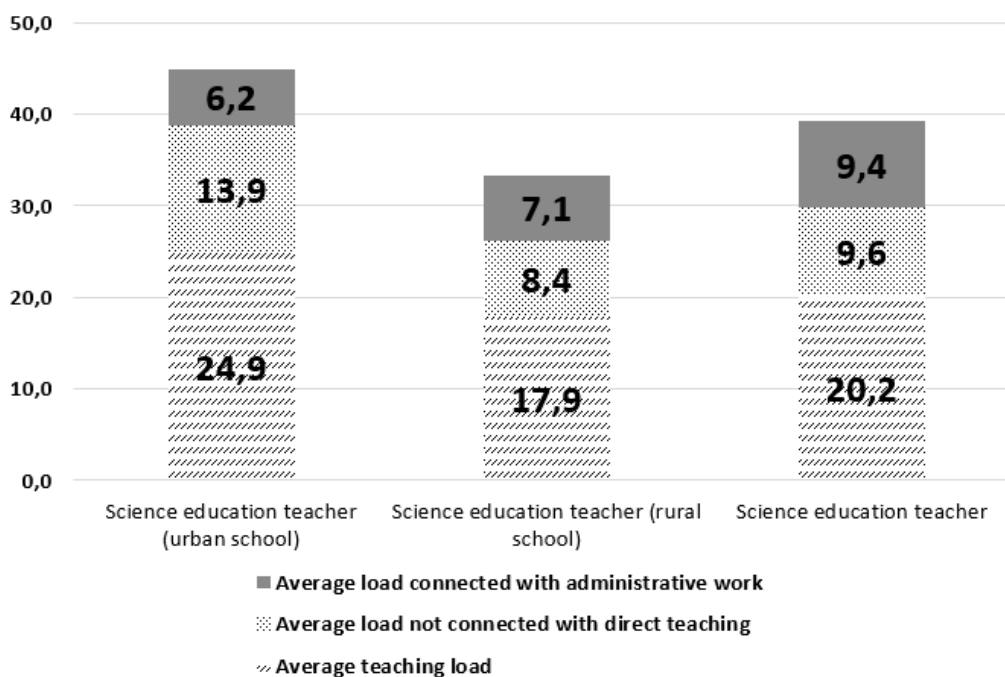


Figure 2. The structure of science education teachers' labor activity taking into account the location of the school (hours)

It should be noted that there are differences in the structure of science education teachers' labor activity if we take into account the location of the school (see Figure 2). For example, the average teaching load for urban educators is 24.9 hours a week, for rural educators - 17.9 hours a week. The average administrative load for the urban sample is 6.2 hours, for the rural sample - 7.1 hours. The average load for the rest of the labor activity in the city was 13.9 hours, in the village - 8.4 hours. Thus, urban teachers have a greater workload than rural teachers, and urban teachers have more administrative work.

We differentiate teachers of science education taking into account age into three groups (see. Figure 3):

- younger age group - up to 35 years old;
- average age group is 35–55 years;
- older age group is 55 years and older.

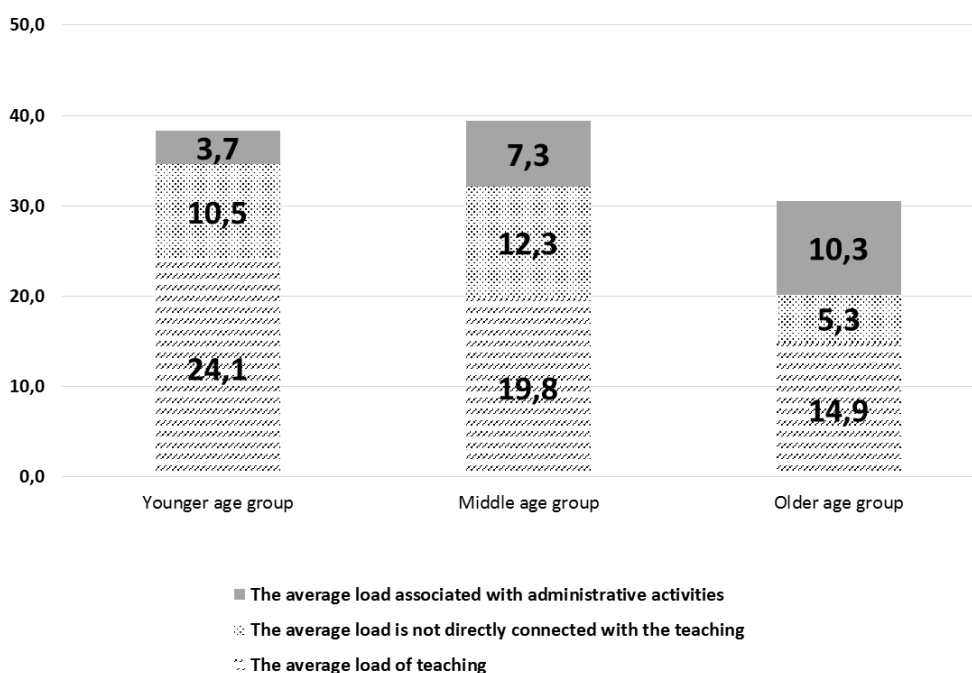


Figure 3. The structure of science education teachers' labor activity taking into account age (hours)

The teaching load for teachers of the younger age group is 1.6 times greater than that of teachers in the older age group (24.1 hours and 14.9 hours, respectively).

On the contrary, the load associated with administrative activities is 2.7 times less for teachers in the younger age group than for teachers in the older age group (3.7 hours and 10.6 hours, respectively). Thus, with age, teachers have a partial redistribution of labor activity from teaching to administrative work.

To obtain information about the total official workload of science education teachers, the study included an analysis of the weekly number of hours spent on all official duties (see Figure 4). Note that, on average, subject teachers and science education teachers spend 21 astronomical hours per week on teaching, and urban teachers of science education work 8 hours more than teachers from rural areas (17 and 25 hours, respectively). It is noteworthy that the direct teaching in the structure of science education teachers' labor activity takes 53% of the official activity.

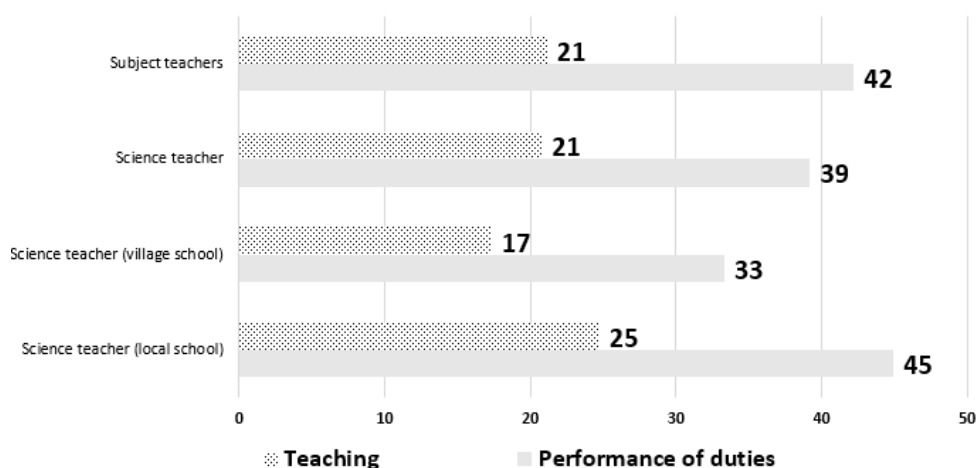


Figure 4. Number of weekly hours, spent by teachers to perform official duties

The distribution of teachers' workload other than direct teaching is shown in Figure 5. Let us note that most of the time teachers of science education devote to individual planning and preparation for lessons (28%), to general administrative work (15%). On the other hand, the least part of time in the structure of official duties is taken by extracurricular activities (4%) and communication with parents and guardians (4%). Thus, the science education teacher spends most time for classes preparation and for consulting and evaluating students, and devotes less time to administrative work (work with documents), communication with parents and other things.

The distribution of time in the lesson allows us to state that, on average, 85% of the time allocated to the lesson is actual training, 5% is spent on maintaining discipline and 10% on organizational tasks (including registering attendance and distributing information materials).

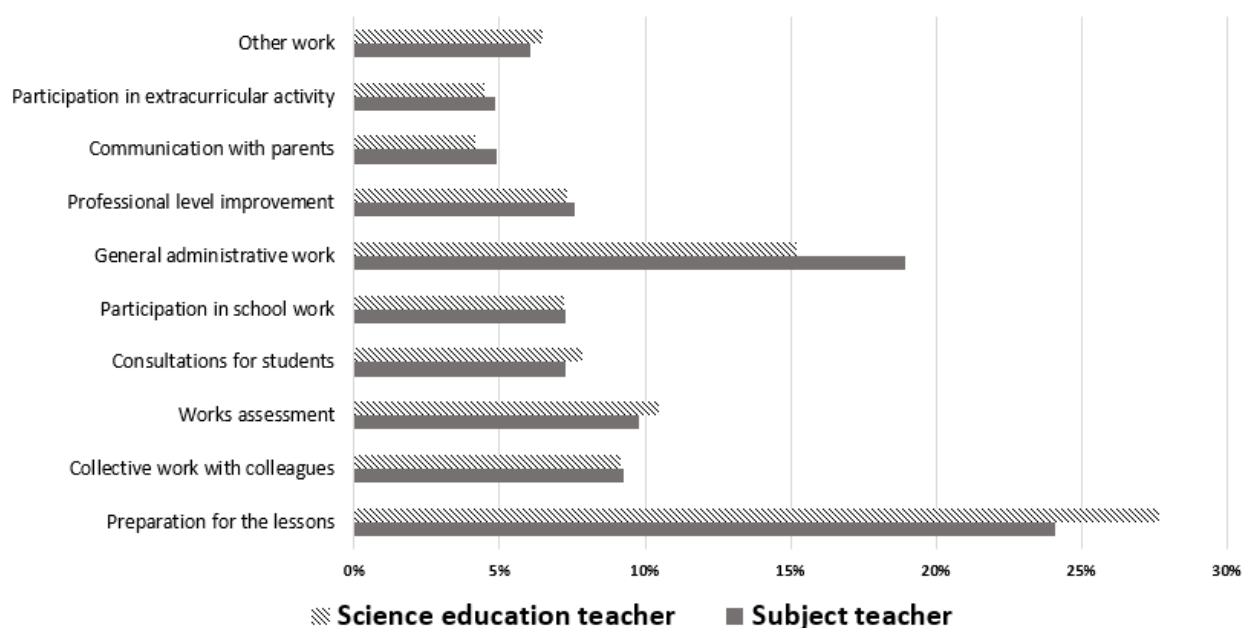
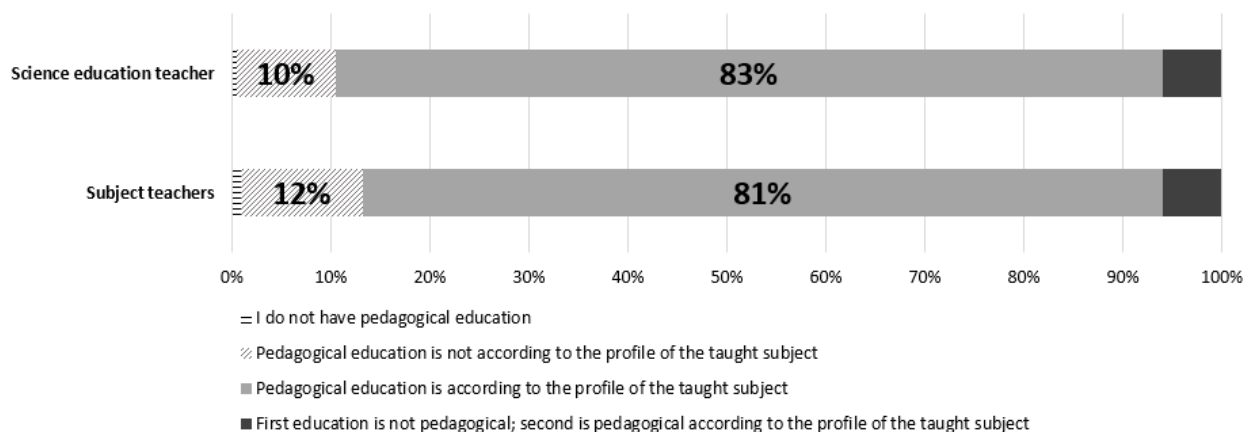


Figure 5. Distribution of science education teachers' workload

If we compare the obtained data with the results of the international research TALIS 2013, then we see that in other countries teachers spend on official duties, on average, 1.2 hours less in comparison with teachers of science education (38 and 39.2 hours, respectively).

#### *Education structure of science education teachers*

Another area of assessing the quality of work of science education teachers is the analysis of the profile of education (see. Figure 6). We should note a high proportion of teachers with specialized education - 83% among science education teachers. For example, social science and history teachers show a mark of 76%, and it is 81% for all subject teachers.



*Figure 6. Analysis of the education profile of science education teachers*

It is worth noting as a positive mark the high proportion of teachers with specialized education among of natural science education teachers - 83%. For example, social science and history teachers show a mark of 76%. In the region - 81%.

The next step in the analysis was selecting the elements included in the education of teachers, and revealing of the degree of teachers' preparedness according to these elements at the time of graduation (see Table. 1).

Let us note that teachers report about studying the following elements during receiving their education, but they assess their preparedness after completing training at an average level:

- the content of some or all of the subjects which I teach;
- the methodology of some or all of the subjects which I teach;
- issues of general pedagogy, theory of training and education;
- teaching practice in some or all of the subjects which I teach.

The following elements are attributed by most teachers to issues that they did not study when receiving their education, and, accordingly, they are insufficiently prepared for pedagogical activity:

- teaching in a classroom with different levels of children development, including inclusive education;
- teaching in multinational and multilingual classes.



Table 1. The educational structure of working science education teachers,%

	Content of some or all of the subjects which I teach	Methodology of some or all of the subjects which I teach	Issues of general pedagogy, theory of training and education	Teaching practice in some or all of the subjects which I teach	Teaching in a classroom with different levels of children development, including inclusive education	Teaching in multinational and multilingual classes	Developing in children meta-subject skills (creativity, critical thinking, problem solution)	Using information and communication technologies	Tutoring and classroom management	Monitoring of students' learning and development
Level of preparedness on graduation	55	52	53	52	16	6	33	36	37	32
The element was included in education	95	95	98	94	25	6	62	63	59	54

Note, that teachers assess the completeness of their knowledge upon graduation at the level of 38% of the required level for performing their duties.

#### The structure of the professional development needs of science education teachers

To identify the nature of the needs of professional development among science education teachers, we made an analysis of professional development needs manifestation level (see Table. 2).

Table 2. The structure of the professional development needs of science education teachers, %

	Subject knowledge	Methodology of teaching	Educational plan knowledge	Methods of evaluation	IT-technology use	Students' discipline	Tutoring	Individual teaching	Teaching children with special needs	Teaching in multinational classes	Developing cross-subject skills	Analysis and correction of students' marks	Teacher - parents collaboration
I do not need at present	24	15	25	18	15	26	27	12	15	47	12	20	18
Low level of need	25	27	33	33	28	30	28	26	22	22	30	35	39
Moderate level of need	43	49	34	40	46	34	34	48	43	22	47	38	35
High level of need	8	9	8	9	11	10	12	14	19	8	11	7	9

We can see a predominant share of teachers with a moderate level of need for knowledge in most areas of professional development. Note that almost every one out of five teachers says about high interest in studying individual learning technologies, teaching children with special needs (including children with disabilities and gifted children), as well as in tutoring issues. In addition, the analysis found that urban teachers of science education are more critical to their level of professionalism (urban teachers' needs - 46%, rural - 37%).

### Discussion

In this study, comparison of the obtained data with the data of other countries participating in the international TALIS study is a subject for discussion. Comparison with the results obtained in TALIS should be done taking into consideration existing national socio-economic conditions.

The data of the international TALIS 2013 study, when compared with the data obtained by us, allow us to state that, on average, teachers in other countries note similar professional needs for professional development as science education teachers. On the other hand, in the most developed countries, teachers note a significantly higher degree of need for professional development. The result of this analysis may be a lower level of critical thinking among teachers in our study or differences in measures to overcome professional deficits.

The conducted study allows us to expand the system of indicators considered earlier in other works that affect the effectiveness of education and science education programs. Therefore, now, when analyzing the quality of science education teachers' work, along with highly specialized indicators, it is possible to take into account: the structure of teaching load, labor activity, teachers' education; professional development needs etc. Comparison with the indicators values of teachers' labor activity quality revealed in the study allows us to analyze the effectiveness of the implemented set of measures for training and methodological support of science education teachers. The obtained values confirm the conclusions presented by Angnakoon and Allen (2016) about the importance of developing teachers' training programs, continuing education courses for teachers and school management staff.

### Conclusion

As a result of a study conducted in 2017–2020, in which 1146 employees of secondary schools of the European part of Russia took part, including 310 science education teachers, we can note: the volume of the teaching load for science education teachers is 0.65; subject teachers spend on average 42.2 astronomical hours per week on official duties, and science education teachers work 3 hours less; a science education teacher with non-specialized education works 4 hours less in comparison with a teacher with specialized education; urban teachers have more workload than rural teachers; with age, science education teachers partially redistribute their labor activity from teaching to administrative work; direct teaching takes 53% of official activity in the structure of education science teacher's workload; science education teachers spend most of their time on individual planning and preparation for lessons (28%) and on general administrative work (15%); the least part of the time in the structure of official duties is spent on participation in extracurricular activities (4%) and communication with students' parents and guardians (4%); teachers evaluate the completeness of their knowledge upon graduation at the level of 38% of the required level for performing labor activities; in most areas of professional development, there is a predominant share of teachers who have a moderate level of need to improve their knowledge in these areas.

### Suggestions

The results of the study allow us to develop a set of measures for the preparation and methodological support of science education teachers. These measures should take into account the specifics of workload and the characteristics of professional deficits.

### Limitations

Assessment of the quality of work of science education teachers should be compared to the implemented set of measures for overcoming professional deficits. The results of the observation show that science education teachers actively use various forms of making up deficits. Thus, the question of assessing the quality of teachers' labor activity may depend on the question of assessing the effectiveness of professional support system for teachers in the school education system. Therefore, it is worth considering the national characteristics of teacher support programs on problems that lie in the field of subject, methodology, pedagogy, psychology, defectology, ICT, legal support and others.

### References

- Ainley, J., & Carstens, R (2018). *Teaching and Learning International Survey (TALIS) 2018 conceptual framework, OECD (Education working papers- 187)*. OECD Publishing. <https://doi.org/10.1787/799337c2-en>
- Ali, T. (2018). Raising teachers' voices: An in-depth qualitative inquiry into teachers' working conditions and professional development needs in Khyber Pakhtunkhwa, a province of Pakistan. *Teacher Development*, 22(1), 78-104. <https://doi.org/10.1080/13664530.2017.1308432>

- Angnakoon, P., & Allen, J. M. (2016). Exploring secondary school teachers' constructivist beliefs using TALIS 2013. *Turkish Online Journal of Educational Technology*, (November), 1002-1011.
- Berkovich, I., & Benoliel, P. (2018). Marketing teacher quality: critical discourse analysis of OECD documents on effective teaching and TALIS. *Critical Studies in Education*. Advance online publication. <https://doi.org/10.1080/17508487.2018.1521338>
- Brezicha, K. F., Ikoma, S., Park, H., LeTendre, G. K. (2019). The ownership perception gap: exploring teacher job satisfaction and its relationship to teachers' and principals' perception of decision-making opportunities. *International Journal of Leadership in Education*. Advance online publication. <https://doi.org/10.1080/13603124.2018.1562098>
- Buric, I., & Kim, L. E. (2020). Teacher self-efficacy, instructional quality, and student motivational beliefs: An analysis using multilevel structural equation modeling. *Learning and Instruction*, 66, 101302. <https://doi.org/10.1016/j.learninstruc.2019.101302>
- Cau-Bareille, D., Teiger, C., & Volkoff, S. (2019). Revealing the hidden processes behind discrimination against part-time teachers in France: A lever for improving their situation. In S. Bagnara, R. Tartaglia, S. Albolino, T. Alexander & Y. Fujita (Eds), *Proceedings of the 20th Congress of the International Ergonomics Association* (pp. 259-268). Springer. [http://doi.org/10.1007/978-3-319-96065-4\\_29](http://doi.org/10.1007/978-3-319-96065-4_29)
- Cleofas, J. V. (2020). Student involvement, mental health and quality of life of college students in a selected university in Manila, Philippines. *International Journal of Adolescence and Youth*, 25(1), 435-447. <https://doi.org/10.1080/02673843.2019.1670683>
- Coleman, J. S. (1968). Equality of educational opportunity. *Integrated Education*, 6(5), 19-28.
- Delgado-Rebolledo, R., & Zakaryan, D. (2020). Relationships between the knowledge of practices in mathematics and the pedagogical content knowledge of a mathematics lecturer. *International Journal of Science and Mathematics Education*, 18(3), 567-587. <https://doi.org/10.1007/s10763-019-09977-0>
- Dogan, S., & Yurtseven, N. (2018). Professional learning as a predictor for instructional quality: a secondary analysis of TALIS. *School Effectiveness and School Improvement*, 29(1), 64-90.
- Fedorov, A. A., Soloviev, M. Yu., Ilaltdinova, E. Yu., Kondratiev, G. V., & Frolova, S. V. (2018). *Age structure of the pedagogical community: analysis and forecast of development: an analytical report*. Minin University.
- Fernandez-Fernandez, S., Arias-Blanco, J.-M., Fernandez-Alonso, R., Burguera-Condon, J., & Fernandez-Raigoso, M. (2016). Reflective and inquiry thinking in education. Aspects to consider in teacher education. *Electronic Journal of Educational Research and Evaluation/ RELIEVE - Revista Electronica de Investigacion y Evaluacion Educativa*, 22(2), 1-16. <https://doi.org/10.7203/relieve.22.2.8425>
- Ford, T. G., Urick, A., & Wilson, A. S. P. (2018). Exploring the effect of supportive teacher evaluation experiences on U.S. teachers' job satisfaction. *Education Policy Analysis Archives*, 26(59), 1-36. <https://doi.org/10.14507/epaa.26.3559>
- Freude, G., Seibt, R., Pech, E., & Ullsperger, P. (2005). Assessment of work ability and vitality-a study of teachers of different age groups. *International Congress Series*, 1280, 270-274. <https://doi.org/10.1016/j.ics.2005.02.099>
- Garcia Torres, D. (2019). Distributed leadership, professional collaboration, and teachers' job satisfaction in U.S. schools. *Teaching and Teacher Education*, 79, 111-123.
- Gardinier, M. P. (2017). Looking back toward the future: Reflecting on the OECD's global educational influence. *International Perspectives on Education and Society*, 31, 247-269
- Gil-Flores, J. (2017). The role of personal characteristics and school characteristics in explaining teacher job satisfaction. *Psychodidactic Journal/ Revista de Psicodidactica*, 22(1), 16-22.
- Gil-Izquierdo, M., & Cordero, J. M. (2018). Guidelines for data fusion with international large scale assessments: Insights from the TALIS-PISA link database. *Studies in Educational Evaluation*, 59, 10-18.
- Han, S. W., Borgonovi, F., & Guerriero, S. (2018). What motivates high school students to want to be teachers? The role of salary, working conditions, and societal evaluations about occupations in a comparative perspective. *American Educational Research Journal*, 55(1), 3-39. <https://doi.org/10.3102/0002831217729875>
- Heinonen, P., Karvonen, U., & Tainio, L. (2020). Hand-on-shoulder touch as a resource for constructing a pedagogically relevant participation framework. *Linguistics and Education*, 56, 1-10. <https://doi.org/10.1016/j.linged.2020.100795>
- Keller, J. E. (2020). The sonic intra-face of a noisy feminist social kitchen. *Social Sciences*, 8(9), 1-22. <https://doi.org/10.3390/socsci8090245>

- King, A. S., Jensen, R. E., Jones, C., & McCarthy, M. J. (2018). Occupational stigma communication: The anticipatory socialization of sex educators. *Health Communication*, (12), 401-1409. <http://doi.org/10.1080/10410236.2017.1353867>
- Madero, C. (2019). Secondary teacher's dissatisfaction with the teaching profession in Latin America: The case of Brazil, Chile, and Mexico. *Teachers and Teaching: Theory and Practice*, 25(3), 358-378. <https://doi.org/10.1080/13540602.2019.1587402>
- Marioni, L. D. S., Freguglia, R. D. S., & Menezes-Filho, N. A. (2020). The impacts of teacher working conditions and human capital on student achievement: Evidence from Brazilian longitudinal data. *Applied Economic*, 52(6), 568-582. <https://doi.org/10.1080/00036846.2019.1650885>
- Mason-Williams, L., Bettini, E., Peyton, D., Harvey, A., Rosenberg, M., & Sindelar, P. T. (2020). Rethinking shortages in special education: Making good on the promise of an equal opportunity for students with disabilities. *Teacher Education and Special Education*, 43(1), 45-62. <https://doi.org/10.1177/0888406419880352>
- Mincer, J. (1958) Investment in human capital and personal income distribution. *Journal of Political Economy*, 66(4), 281-302.
- Mu'in, F., Al-Arief, Y., Amelia, R., & Fadilla, R. (2018). Investigating teacher professional development: English teachers' learning activities as learners. *Asian EFL Journal*. 20(12). 310-346.
- Oerke, B., & Bogner, F. X. (2010). Gender, age and subject matter: Impact on teachers' ecological values. *Environmentalist*, 30(2), 111-122. <http://doi.org/10.1007/s10669-009-9250-4>
- Pinskaya, M. , Lenskaya, E. A., Ponomareva, A. A., Brun, S. G., Kosaretsky, S. G., & Savelyeva, M. B. (2016). What did we learn about our teachers and principals? Results of the TALIS-2013 International Comparative Study. *Russian Education and Society*, 58(7-8), 491-510. <https://doi.org/10.1080/10609393.2016.1298372>
- Popov, D. S. (2018). The quality of teachers: Russia against the background of countries of the world. Education and science in Russia: state and development potential. *Collection of scientific articles*, 3, 169-188
- Price, H. E., & Weatherby, K. (2018). The global teaching profession: how treating teachers as knowledge workers improves the esteem of the teaching profession. *School Effectiveness and School Improvement*, 29(1), 113-149.
- Pugach, V. N., & Utemov, V. V. (2016). Expert-analytical assessment of the age structure of the personnel potential of educational institutions of the Kirov region. *Scientific-methodical electronic journal «Concept»*, 17, 974-986.
- Russian Federal State Statistics Service. (2016). *On Approval of Statistical Tools for Organization by the Ministry of Education and Science of the Russian Federation of federal statistical monitoring of the activities of organizations providing training in educational programs of primary general, basic general and secondary general education*. Rosstat.
- Sheridan, M. A., McLaughlin, K. A., Winter, W., Fox, N., Zeanah, C., & Nelson, C. A. (2018). Early deprivation disruption of associative learning is a developmental pathway to depression and social problems. *Nature Communications*, 9(1), 2216. <http://doi.org/10.1038/s41467-018-04381-8>
- Sibgatullina, T. V., Utemov, V. V., Galushkin, A. A., & Zaitseva, N. A. (2019). Age Heterogeneity of STEM Educators. *Eurasia Journal of Mathematics, Science and Technology Education*, 15(7), em1730. <https://doi.org/10.29333/ejmste/108429>
- Sorensen, T. B., & Robertson, S. L. (2019). Reframing teachers' work for global competitiveness: New global hierarchies in the governing of education. In K. J. Saltman & A. J. Means (Eds), *The Wiley Handbook of Global Educational Reform* (pp.87-111). John Wiley & Sons, Inc.
- Sun, A., Xia, J. (2018). Teacher-perceived distributed leadership, teacher self-efficacy and job satisfaction: A multilevel SEM approach using the 2013 TALIS data. *International Journal of Educational Research*. 92. 86-97.
- Toropova, A., Myrberg, E., & Johansson, S. (2020). Teacher job satisfaction: The importance of school working conditions and teacher characteristics. *Educational Review*, Advance online publication. <https://doi.org/10.1080/00131911.2019.1705247>
- Center for social forecasting and marketing. (2017). The number of students, teaching and teaching staff, the potential number of educational organizations of all levels of education: the forecast to 2035. 408.
- Utemov, V. V., & Simonova, G. I. (2018). Trajectory of Kirov region teaching community development in terms of age heterogeneity. *Scientific-methodical electronic journal «Concept»*, 9, 128-143.
- Utemov, V. V. (2019) A Comparative Study of the Qualities of School Teachers and Their Teaching Practice. In R. Valeeva (Ed.), *Proceedings of ARPHA - V International Forum on Teacher Education*. Kazan Federal University. <https://doi.org/10.3897/ap.1.e0698>

- Wilson, V., Powney, J., Hall, S., & Davidson, J. (2006). Who gets ahead?: The effect of age, disability, ethnicity and gender on teachers' careers and implications for school leaders. *Educational Management Administration & Leadership*, 34(2), 239-255. <http://doi.org/10.1177/1741143206062496>.
- Xuehui, A. (2018). Teacher salaries and the shortage of high-quality teachers in China's rural primary and secondary schools. *Chinese Education and Society*, 51(2), 103-116. <https://doi.org/10.1080/10611932.2018.1433411>
- Zhou, D., Huang, J., Tang, L., Zhu, Y., Fei, Z., & Li, Y. (2011). Grey relational analysis of Pudong teacher training-studying network - though the survey data and grouped under age and gender. In *Proceedings of 2011 IEEE International Conference on Grey Systems and Intelligent Services* (pp. 121-126). IEEE. <http://doi.org/10.1109/GSIS.2011.6044008>