

Education system features in the Arctic Economic Zone of the Republic of Sakha (Yakutia) of the Russian Federation: An expert assessment

Características del sistema educativo en la Zona Económica Ártica de la República de Sakha (Yakutia) de la Federación Rusa: una evaluación de expertos

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ABSTRACT:

The assessment allowed for a more accurate description of the current situation in the education system of the Arctic Economic Zone, for identification of challenges and emerging trends, as well as of territorial imbalances in education development there, related to the socio-economic environment in the area. The elaborated set of development indicators for territorial education systems would contribute to improving the quality of monitoring and forecasting sustainable development of the education system in the mentioned zone based thereon.

Keywords: Education System Assessment, Educational Effectiveness, The Russian Arctic Region.

RESUMEN:

La evaluación permitió una descripción más precisa de la situación actual en el sistema educativo de la Zona Económica del Ártico, para la identificación de desafíos y tendencias emergentes, así como de los desequilibrios territoriales en el desarrollo de la educación, relacionados con el entorno socioeconómico en la región. El conjunto elaborado de indicadores de desarrollo para los sistemas de educación territorial contribuiría a mejorar la calidad del monitoreo y la previsión del desarrollo sostenible del sistema educativo en la zona mencionada en base al mismo.

Palabras clave: evaluación del sistema educativo, efectividad educativa, la región ártica rusa.

1. Introduction

One of the key conditions for modernization of education in the Russian Federation and for a

growth in the country's human potential is to increase the efficiency of education management and to create an education assessment system. Today the required groundwork for education development and for measuring its quality and availability is possible only if there is credible knowledge about the actual state of affairs in this area. Trends such as growing differentiation of educational institutions, reorientation of the system to meet diverse and dynamically changing demands of the labor market and students themselves, as well as changes in financing mechanisms are setting new objectives for the education management system and make the management process itself much more complex. This requires availability of up-to-date and objective information about the status of education system and the processes occurring in it; such information that would lay the groundwork for analyzing and predicting the situation and making informed decisions based thereon at all management levels.

A distinctive feature of the present stage of education development in Russia has become its regionalization and municipalization. They are premised on ensuring a common education space in the country, taking into account the national and regional contexts of the constituent entities of the Federation.

The uniqueness of natural, geographical, socio-economic, ethno-demographic and other environments in the country, as well as dynamic development of education cause a variety of education systems models. Each system, with a certain invariable component, is distinguished by its national and regional contexts. In this respect, study of problems of assessing the status and development of territorial education systems can be viewed as one of the activities that would provide a solution to specific social and pedagogical problems through fundamental theories.

Currently, development of the Arctic economic zone of RS(Y) of the Russian Federation is receiving much attention. The territory of the Arctic economic zone includes 13 municipal districts of the RS(Y) of the Russian Federation, with the main features identified as follows: uncomfortable living conditions for the population, influence of permafrost rock mass factors, biomedical and socio-economic factors, integrity of the natural economic territorial complexes and the transportation industry, importance of the territories for economic growth and security of the Arctic zone of Russia. A large number of educational organizations are located in this area, including nomadic and underfilled schools. Formation of different models of regional education systems necessitates research practices on education assessment in the Arctic Economic Zone of the RS(Y), identification of regional imbalances in the availability and quality of education in order to forecast education development in the mid-term and long-term perspective.

2. Literature review

For the present, Russian and foreign literature has accumulated considerable experience in defining educational indicators. The research drew on a number of papers that provided insight into the problems of using statistical data and monitoring in decision making (Agranovich, Konstantinovskiy, Loginova 2006; Volkova, Sokolova, 2006); on papers dealing with indicators for assessing education management and quality of secondary school education in the RS (Y) (Nikolayev, Savvinov, Mikhalyova, 2009; Pudenko, 2014; Nikolayev, Savvinov, 2016; Petunin, 2018); performance indicators of education development programs and methods of their evaluation (Bahmutskiy, Savvinov, 2005). Statistical compendia of the Regional Office of the Federal State Statistics Service for the RS (Y), the Higher School of Economics (HSE), government programs, development strategies for the Arctic zone of the Russian Federation, and materials of the UNESCO International Standard Classification of Education were used (ISCED, 2008; Statistical compendium, 2006, 2017; International indicators in education, 2006; Statistical compendia of the HSE, 2017), as well as papers that described Russian and international experience in monitoring and evaluating education systems (Kovalyova, 2004; Nikolayeva, 2008; Zhelezov, 2008; Klimenko, 2009; Fomitskaya, 2010; Chorosova, Gerasimova, Solomonova, Zakharova, 2018; Oyeniran, 2018) and works of foreign researchers in the field of education management, evaluation of educational attainments, and monitoring (Merriam, 1988; Tuijnman, 1994; Lucas, 1997; Marimon,

2004; Ochs, 2006; Creswell, 2012; Kamens, 2013; Silander & Valijarvi, 2013; Zhao & Meyer, 2013; Baird, 2014). However, national and international indicators cannot be fully applied to regional education systems, taking into account huge differences in the specifics of individual countries and territories in the Russian Federation, from geographical location and climate to institutional and cultural traditions. Nevertheless, with all their conventionality, international indicators allow one to set forth global trends in educational development and determine the degree of compliance or non-compliance of structural characteristics of education systems in individual countries with them. Yet, in the recent decade, Russia has used unified indicators of education development, whereby each region can use its own indicators for more detailed analysis and examination, taking into account its territorial features. This research was carried out for the first time in the Republic of Sakha (Yakutia) of the Russian Federation; materials taken as a basis thereof had not ever been subject to such an extended analysis and evaluation. At the same time, the choice of indicators was based on expert judgment and may be debated. The study and analysis of the existing body of work shows the absence of single key indices (indicators) that would determine the education system development in the Arctic Economic Zone of the Republic of Sakha (Yakutia) of the Russian Federation. In this regard, the status of and identification of features of the education system in the Arctic Economic Zone of the Republic of Sakha (Yakutia) of the Russian Federation should be studied in more detail.

3. Materials and Methods

Research methods: theoretical methods (analysis and synthesis, comparison, classification, expert evaluation, and generalization); empirical methods (literature searches, studying statistics, documents, and the activity results, methodology evaluation, including particular methods correlated in a certain way); methods of summarizing and processing the research results (statistical methods).

Calculation of an integrated index of education system by municipal districts is premised on a number of indicators that allow the authors to quantify and forecast the situation for the next few years. The calculations were based on data from the regional Office of the Federal State Statistics Service for the RS(Y), data from the Ministry of Education and Science of the RS(Y), heads of municipal districts and principals of educational organizations over the period of 2007-2016 (Statistical compendium, 2006, 2017; Statistical compendia of the HSE, 2017; state budget professional educational institution websites, 2017).

Three following groups of indicators were taken as a basis for calculating the integrated index of the educational system of the Arctic Economic Zone of the RS (Y) of the Russian Federation: indicators of the number of educational organizations and the number of students (pupils), indicators of floor space of organizations and their occupancy rate, and indicators of the educational background of teachers. For each level, the number of students (pupils) in educational organizations (people) and the number of all educational organizations in municipal districts (units) was taken as a basis, which made it possible to calculate the number of students (pupils) per educational organization. The data on the floor space of all the premises of educational organizations and the number of students (pupils) in the educational organizations allowed the authors to calculate the amount of floor space per student (pupil) and conduct a comparative analysis. Finding the percentage of teachers with higher educational background with reference to the total number of academics allowed the authors to determine the compliance of staffing indicators of educational programs with the requirements of the Federal State Education Standards and those of the regulatory framework with regard to teachers as faculty members in an organization conducting educational activities to implement higher educational programs. For these calculations, a linear scaling method was used based on identification of reference points (maximum and minimum values of indicators), which thereby shows the real position of indicators of each specific municipal district among them. The calculation was made by formula (1):

$$a_{ij} = \frac{X_{ij} - X_{j \min}}{X_{j \max} - X_{j \min}} \quad (1)$$

Then, the indicator values were normalized using a linear membership function of the indicator values to a standard interval from 0 to 10.

Calculation of an integral estimate applied to the calculation results by indicators using the linear scaling method allows one to estimate actual indicators in points with reference to patterns or standards whose value is taken as the maximum score. When using the integral estimate calculation method, the intervals of allowed indicator values obtained by means of the linear scaling method were determined. Depending on the indicator content, the highest values were taken as maximum and the lowest values – as minimum. The resulting integrated index was calculated by summing all the indicators (points) multiplied by the weight of each indicator. According to the calculation method, the integral weight should be equal to 1, whereby the weight values of each group of indicators were estimated equally (0.333 per group).

The calculation was made according to formula (2):

$$X_i = \sum_{j=1}^m k_j * a_{ij} \quad (2)$$

where k is the calculated weight of each indicator.

In the calculations, the maximum value (when calculating the occupancy rate of educational organizations and the amount of floor space per pupil/student) and the mean value of this indicator (when calculating the share of teachers with higher educational background in educational organizations) were taken as a standard. Subsequently, all the gathered data were processed in the Microsoft Excel spreadsheet application and summarized in a table. Based on this table, a graph of the dynamic pattern for the period of 2007-2016 was constructed (Figure 7). To obtain a comparative picture of integrated indices, there was a need for comparison with the educational systems of adjacent territories; therefore, similar calculations were made for the other four economic zones of the RS (Y) of the RF: Central, Southern, Eastern, and Western zones.

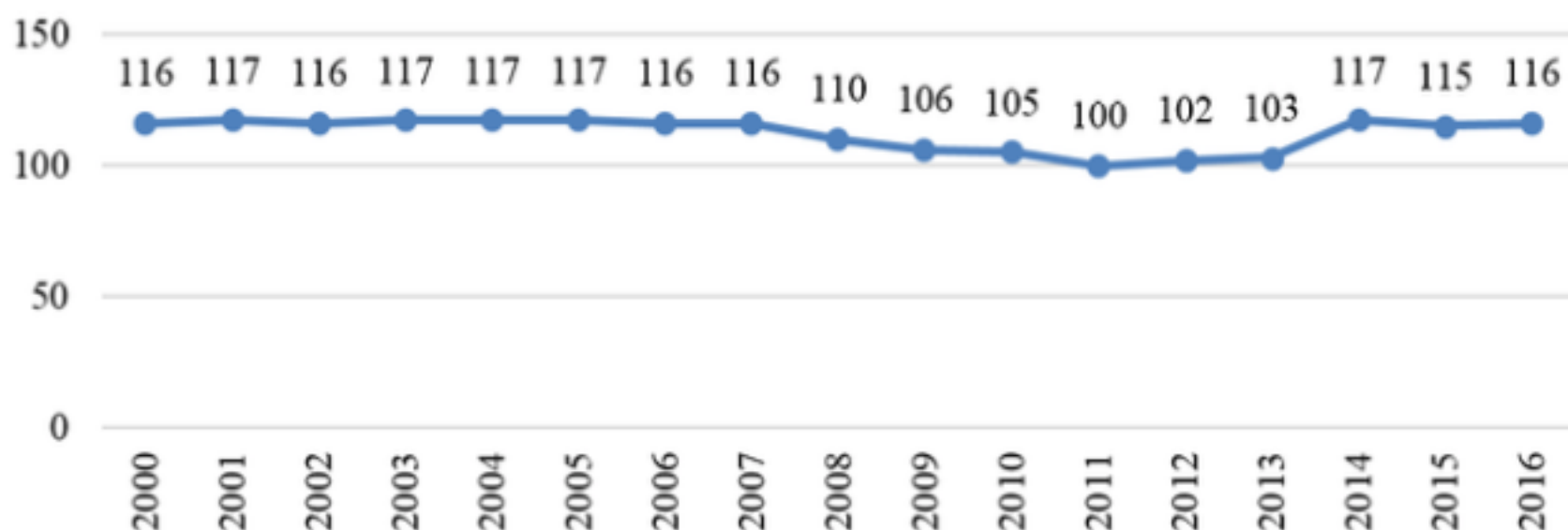
4. Results

The Arctic zone of the northernmost region of Russia, which includes 13 Uluses (Districts), was taken as the subject of the research. The Arctic territory fulfills a special function – hosting peoples that are small-numbered on a global scale and live on a vast territory with harsh climatic conditions – as a source of a unique experience of people living in extreme natural climatic conditions and preserving the traditional northern culture of natural management, which is indispensable for the world civilization. There are areas of compact settlement of indigenous small-numbered peoples of the North who have centuries-long experience of coexistence with nature and survival in extreme climatic conditions in this territory, leading a traditional way of life and husbandry. This territory is furthest from the center of the republic, consequently, there are problems associated with arrangement of transportation, seasonality of its operation and isolation from cultural and economically developed centers.

According to the Federal Law “On Education in the Russian Federation” 273-FZ of December 21, 2012, the education system in the Arctic Economic Zone of the RS (Y) of the RF was analyzed according to the education levels fixed by Article 10 of the law (Federal Law, 2012). The analysis showed the following: for the period of 2008-2011, there was a reduction in the number of pre-school institutions (in Allaikhovskiy and Abyiskiy districts (Figure 1) where they were closed because of an advanced state of disrepair). Since 2014, there has been an increase in this indicator value (a growing number). An increase in the

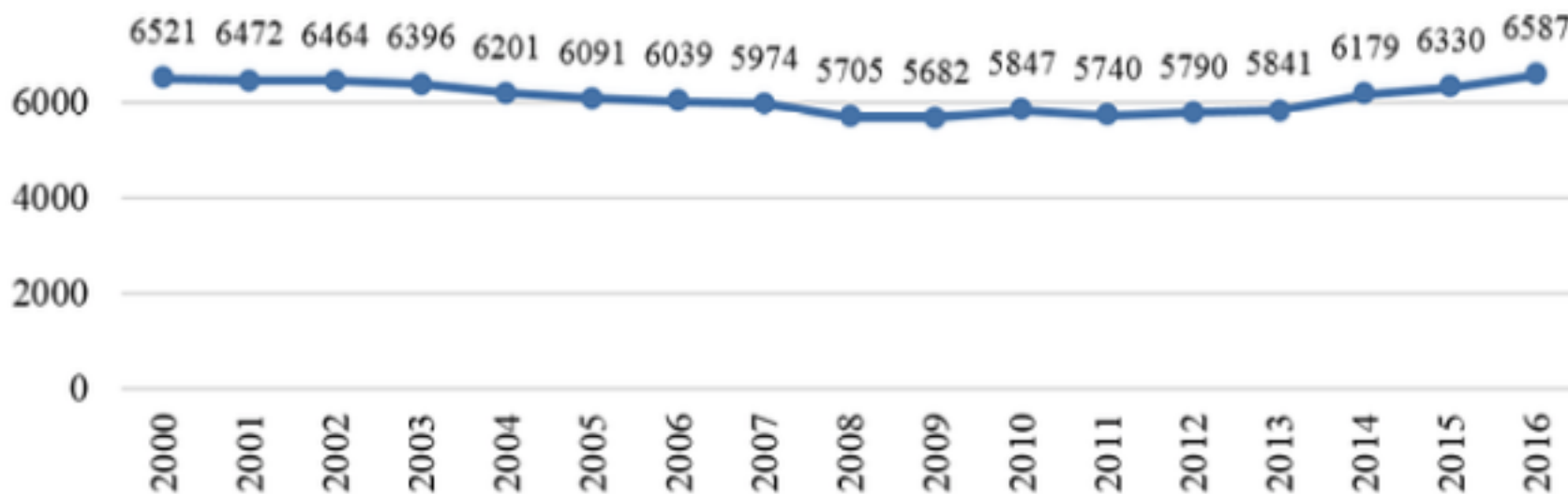
indicator value is ensured by creating additional facilities, refurbishment of pre-school buildings and development of variable forms. Most of these organizations are government and municipal pre-school educational institutions (PEIs) – 95, as well as groups organized at the premises of general educational establishments and organizations of extended education – 21 (Statistical compendium, 2006, 2017; Government Program, 2017).

Figure 1
The number of PEIs in the AEZ of the RS (Y) of the Russian Federation, implementing preschool education programs



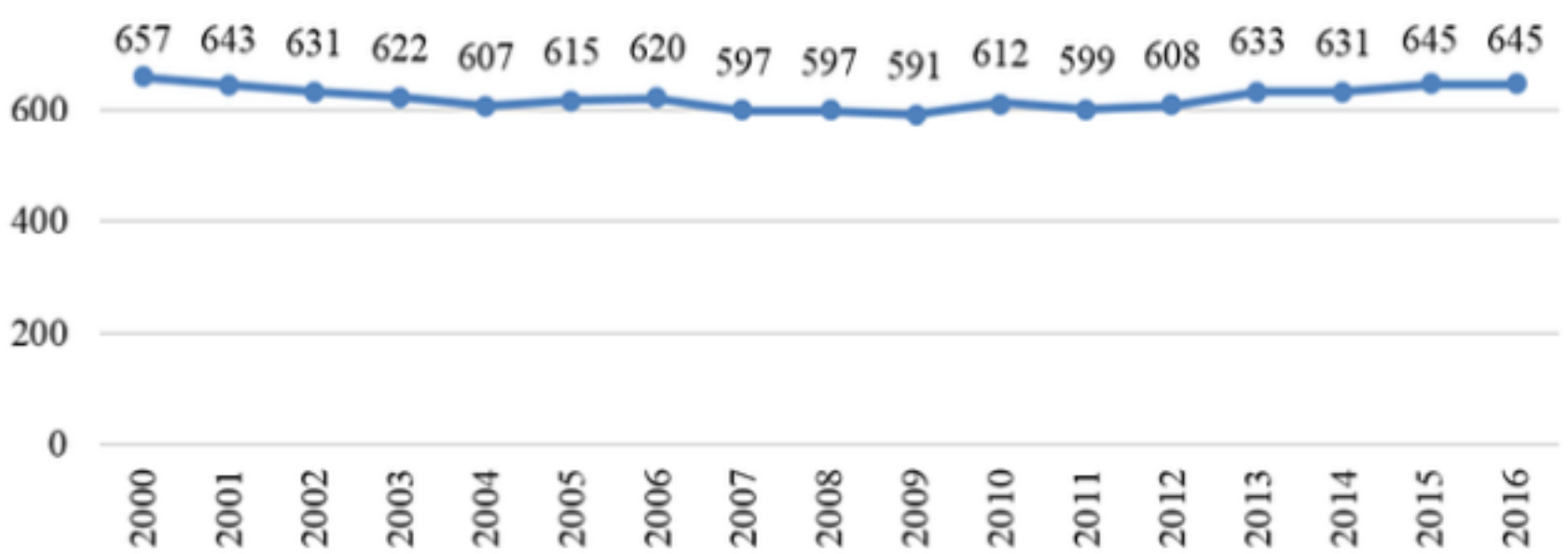
A population decline in the AEZ in 2008-2013 affected a reduction in the number of children attending organizations carrying out educational activities according to pre-school educational programs (Figure 2).

Figure 2
The number of children attending organizations carrying out educational activities according to pre-school education programs (persons)



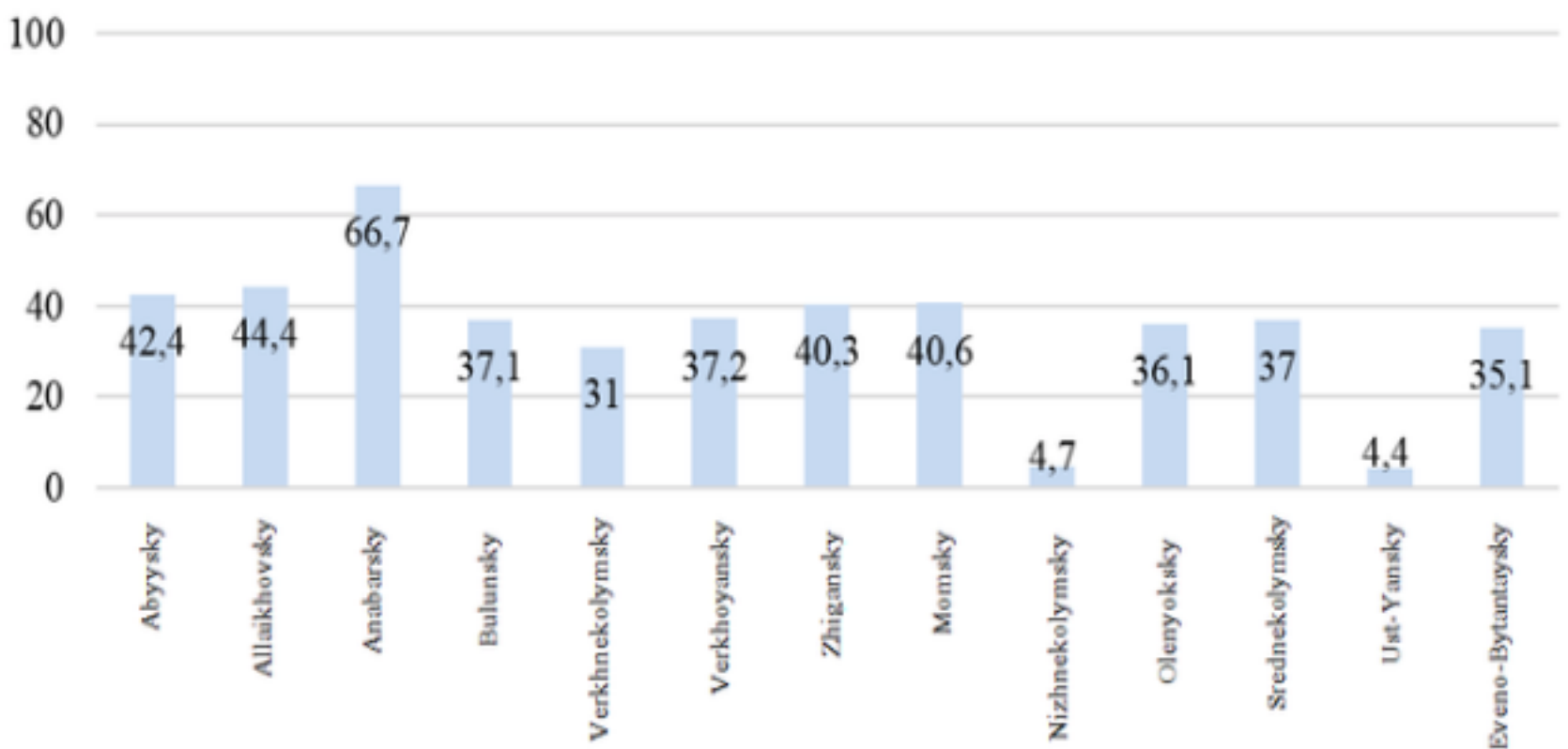
In 2016 compared to 2000, there was a slight decrease in the number of teaching staff, from 657 to 645 people (Figure 3) (Statistical compendium, 2006, 2017). During the period under analysis, the most significant reduction in the number of teachers was observed from 2007 to 2011. The reasons were a declining number of children attending pre-school educational institutions and migration of employable population because of insufficiently developed social infrastructure in those years.

Figure 3
The number of teaching staff in PEIs (people)



Regarding the data across the Republic (56.9%), the indicator of the percentage of teachers with higher educational background in the area under study is low – 39.3%. Over the period from 2011 to 2015, the share of academically trained education workers increased only by 3% (36.2% in 2011 against 39.3% in 2016).

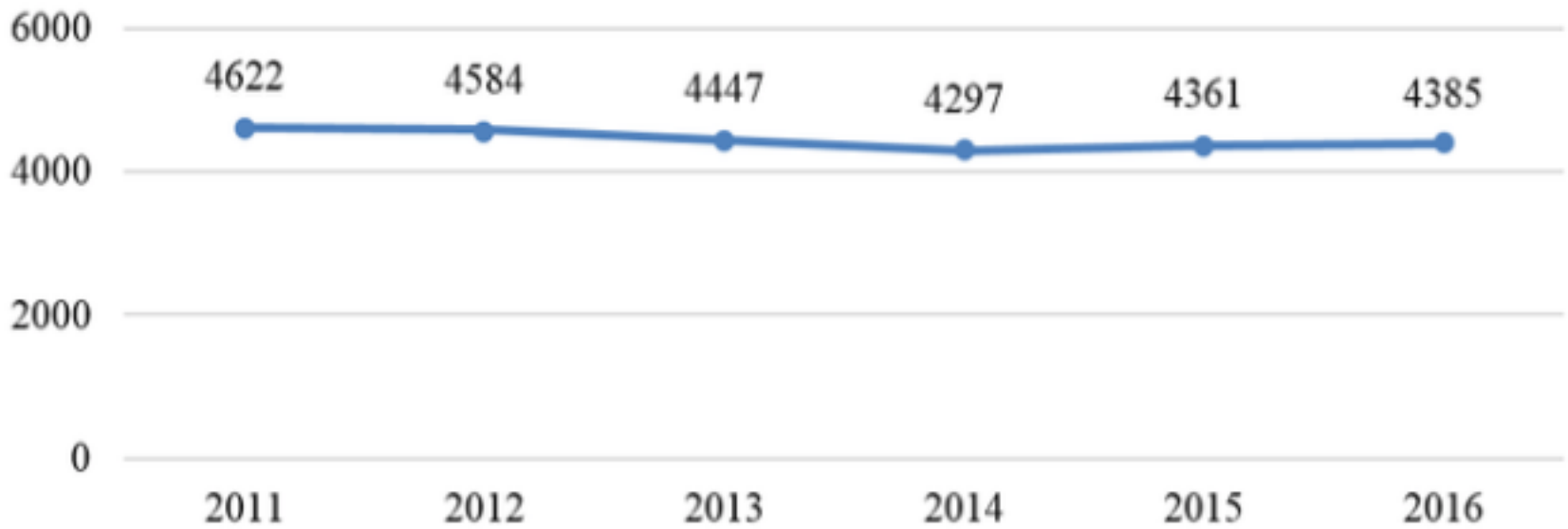
Figure 4
Share of teaching staff in PEIs with higher educational background (in 2016, as %)



The data in Figure 4 indicate that there is a significant difference in the educational and professional levels across the group of districts. This is explained by the fact that travelling to the capital of the republic to study is fraught with financial difficulties: for example, the cost of travel from teachers' places of residence to Yakutsk varies from 18 to 24 thousand rubles.

Municipal general education institutions in the Arctic Economic Zone are represented by 74 secondary (complete) general educational organizations, including four gymnasiums, two special (remedial) educational institutions for children with health limitations, and one general educational institution with advanced study of certain subjects. About 50% of schools have the underfilled status and about 7% of all schools are actually underfilled without being assigned the status. Most of the educational institutions in the Arctic Economic Zone are located in rural areas, accounting for 79.4% of schools. In the Arctic zone there are 13 nomadic schools, four of which are elementary. According to statistical data (Statistical compendium, 2006, 2017) since 2000, the total number of students at all the stages of education over the past 15 years has decreased by 39% on average throughout the zone, especially in the period before 2008 (Figure 5).

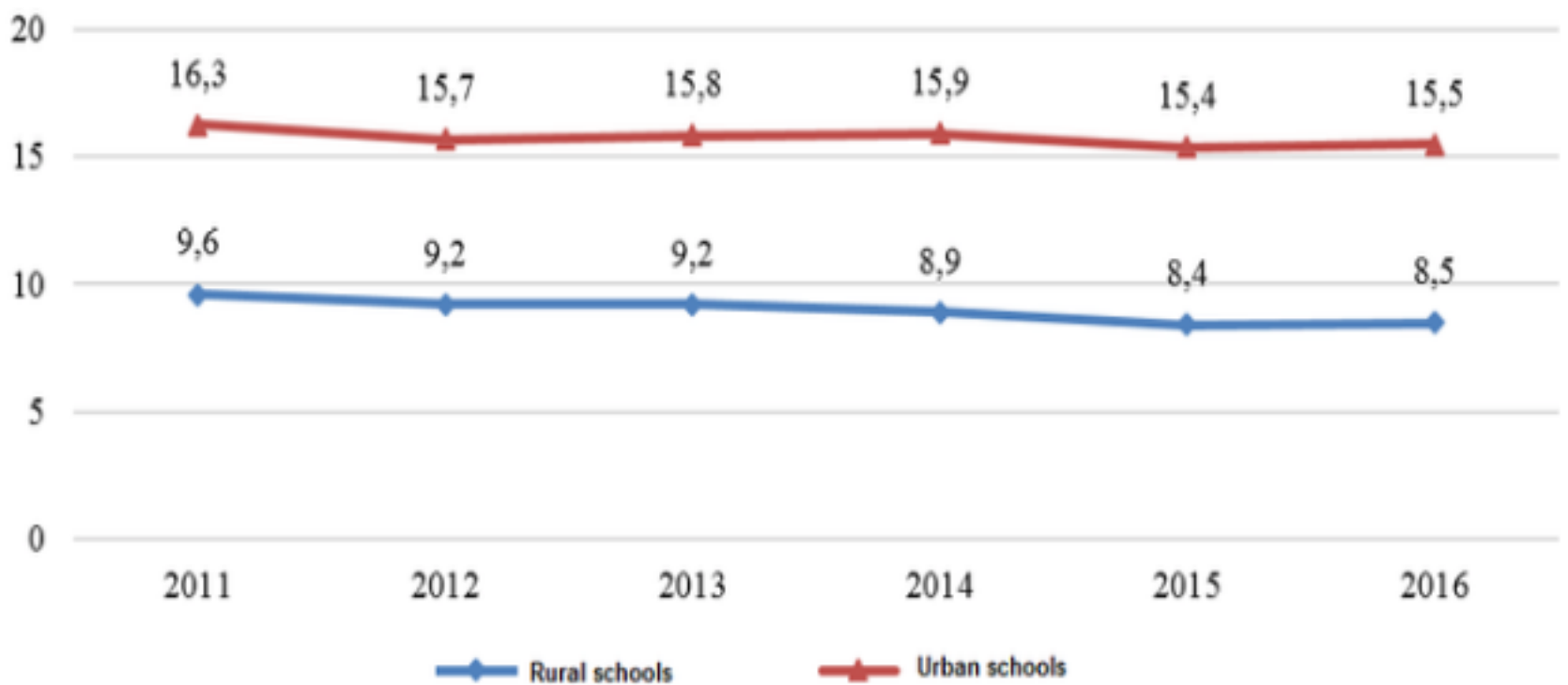
Figure 5
The number of primary school students in the AEZ



The number of students in 2016 was the highest in the Verkhoyansky District (1947 people); the Bulunsky (1103 people), Srednekolymsky (1335 people) and Ust-Yansky (1022 people) districts stay ahead as well. At the same time, a significant growth in the number of primary school students is observed in the Kolyma group of uluses (Verkhnekolymsky, Srednekolymsky and Nizhnekolymsky, Anabarsky, and Zhigansky). This trend characterizes prospects for the upward trend in the number of secondary school students over the coming years. The identified trends in population decline in the Arctic zone confirm the anticipated risks outlined in the Development Strategy for the Arctic Zone of the Russian Federation (Socio-Economic Development Strategy, 2017) and national security strategy for the period up to 2020 (Development Strategy for the Arctic Zone of the Russian Federation, 2017). These trends can be moderated by actions expected to enhance the quality of life of the population based and employed in the Arctic zone.

The average number of students per class (the occupancy rate) in rural schools in municipal districts is shown in Figure 6. From 2011 to 2016, no perceptible changes were observed, the average number of students per class in the districts persisted. The occupancy rate (2-3 people) in those years was the smallest and critical in Allaikhovskiy and Verkhnekolymskiy districts. A relatively high number of students per class was recorded only in Anabarsky (13.9 people), Zhigansky (10.9 people), Olenyoksky (12.3 people), and Eveno-Bytantaysky (11 people) districts, where the administrative center is a village and not a town (or an urban-type settlement). Therefore, occupancy rate in rural schools is calculated taking into account schools in the administrative center of each district. In general, the situation is characterized by persistently underfilled rural schools (Figure 6).

Figure 6
Average number of students per class in rural and urban schools in the AEZ districts (people)



There is a slightly growing trend in the number of students per class by 1-2 people in Verkhnekolymsky, Nizhnekolymsky, and Srednekolymsky districts of the republic in urban schools (2011-2016). In all the other districts, the occupancy rate has fallen, which is evident from the decline in the number of students over the last five years (Figure 6). On average, no critical decline or a noticeable increase in the number of students per class in urban schools in the Arctic zone has been identified over five years; a slight annual decline in this indicator persists. This situation also confirms the content of the Forecast of long-term socio-economic development of the Russian Federation for the period up to 2030 (2017) that outlines prospects for increasing the number of students in general education schools in major population centers and its reduction in small village schools.

In the context of current transition of general educational organizations in the Arctic zone to new educational standards, physical infrastructure in educational institutions is being further improved. The total floor space of all educational institution premises in the Arctic zone has remained practically unchanged from 2003 (172,317.7 square meters) to 2015 (174,721 square meters). At the same time, material and technical resources are of particular importance for nomadic schools, which are the most numerous in the Arctic zone across the republic. In this regard, the main focus in the Strategy of Social and Economic Development of the RS (Y) to 2030 (2017) will be maintained on the Arctic zone to ensure implementation of tasks related to modernization of the network of nomadic schools in the republic and development of the national education system of the indigenous minorities of the North.

Regarding the professional educational background of teachers in the Arctic zone, there has been an increase from 70.4% in 2011 to 77.6% in 2016. Nevertheless, teachers in the Arctic zone are still behind teachers in the central zone on the percentage of top-rank teachers, although over the past five years there has also been a tendency for significant intensification of academic efforts towards this. The average performance for this indicator has increased from 11.7% to 20.2% over the past five years. The number of top-rank teachers is the lowest in Ust-Jansky (7% in 2016, 1% in 2011). There was a noticeable increase therein during that period in Anabarsky (8% in 2011, 24% in 2016), Verkhnekolymsky (9% in 2011, 22% in 2016), Momsky (5% in 2011, 32% in 2016), and Eveno-Bytantaysky (0% in 2011, 17% in 2016) districts.

The percentage of teachers in retirement age in all the districts is approximately the same (varying from 20 to 33%). Moreover, it should be emphasized that due to implementation of programs to support young teachers in the republic, the Arctic group of districts is characterized by even lower staff ageing rates in contrast to the central zone where the average rate reaches 40%. However, the general trend of personnel ageing is also characteristic of the Arctic zone.

Thus, in the Arctic Economic Zone as a whole, there are trends of a slightly declining number of teachers, the annual ageing of teaching employees, and a decrease in the number of

young teachers with work experience from two to five years, which indicates the fact that young employees, having worked up to five years, leave for the central districts and the vacancies are filled on an annual basis with alumni who have just graduated from universities or secondary vocational educational institutions. However, the percentage of academically trained and top-rank teachers is growing.

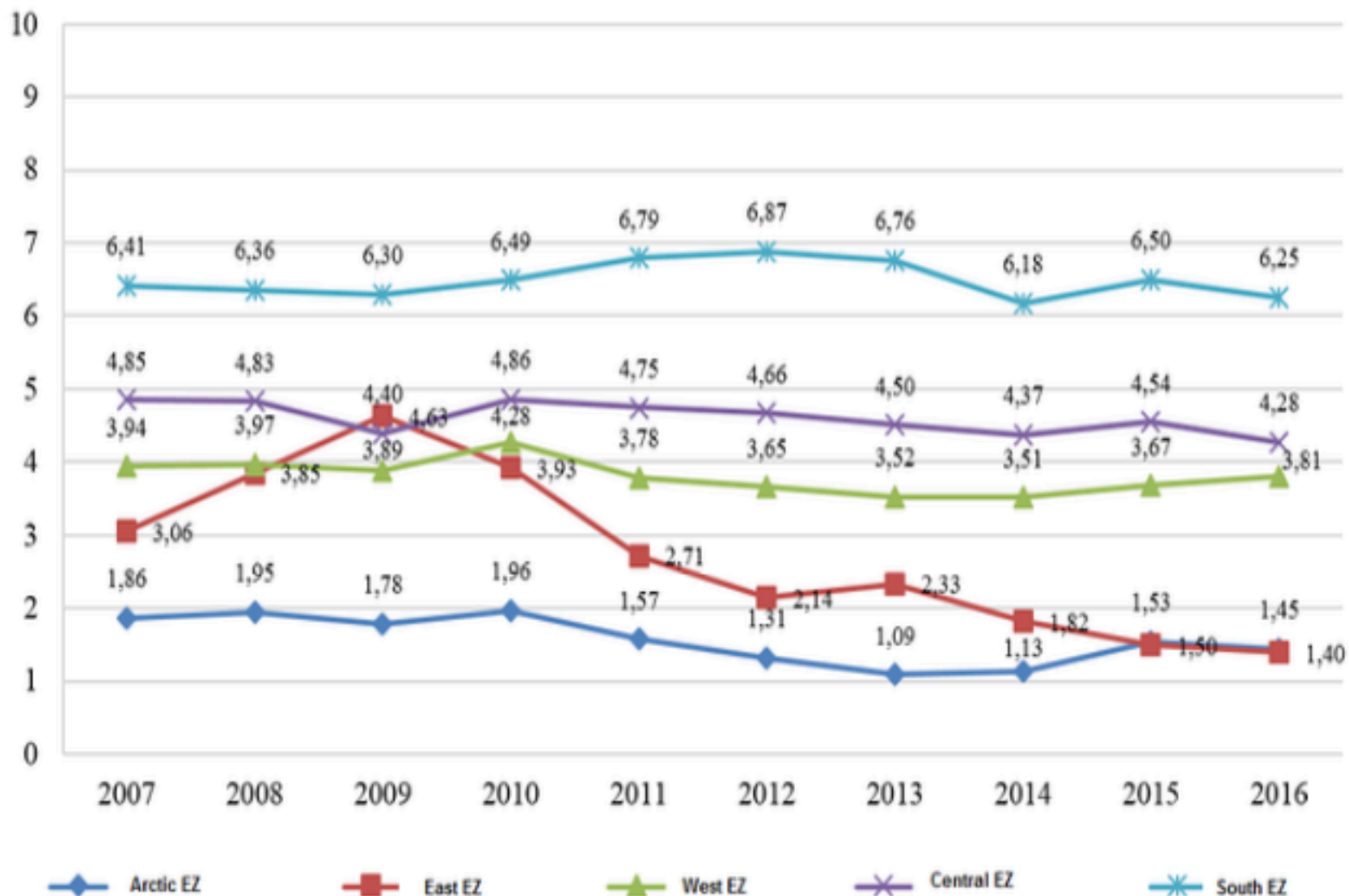
The network of Secondary Vocational educational institutions in the Arctic Economic Zone is represented by four (4) institutions. According to the data, the percentage of academically trained teachers against the total number of teachers in vocational educational organizations increased from 68% to 89% between 2004 and 2016, that is, by 31%. These indicators correspond to average indicators across the Republic. The number of teachers with less than three years of experience in teaching in the system of vocational education increases every year, but this indicator is decreasing in these professional educational institutions in comparison with 2004. The highest rate of 45% was in 2009 and 13.75% in 2016. The proportion of teachers of retirement age decreases every year: in 2016, the ratio of such teachers reached 8.75%. After the Network of Vocational Education was optimized in 2016, the share of teachers in the retirement age throughout the Republic has been 20% (Register of licenses issued, 2017; the websites of the professional educational institutions, 2017).

A number of 478 students studied at these institutions in 2004, in contrast to 2016 with only 362 people; the reduction in the number of students was 25% with regard to a general trend of reduced admission quotas in these educational institutions. Thus, it should be noted that over the past five years, effective measures have been taken to maintain the number of students, which has made it possible to reduce the percentage of unexcused school dropouts.

The results of calculating the integrated index of comprehensive assessment of the education system in the RS (Y) in the Arctic Economic Zone for 2007-2016 (Figure 7) showed relative stability. Compared with the other economic zones, the Arctic Economic Zone has a relatively low level (the score varies within the range of 1-2 points), which is mainly because of a low population density, socio-demographic, spacial, and other features of the economic zone. The underdeveloped infrastructure, transport and logistical systems, as well as the Arctic natural and climatic conditions strengthen the influence of the above factors. The need to improve living conditions for the economically active population of the Arctic is also to be met, if possible, by encouraging young people who graduate from universities to return to the North and by consolidating the local vocational education network.

Figure 7

Assessment of the education system by economic zones of the RS (Y) of the Russian Federation (municipal district average in each economic zone) in dynamics from 2007 to 2016 (in points)



5. Discussion

The applied method of comparative evaluation of municipal districts of the RS (Y) based on the integrated index calculation allows not only for objective inter-municipal statistical comparisons but also for a more realistic view of the development level of the education system in individual municipal districts.

Thus, the calculation of the integrated index of comprehensive assessment of the RS (Y) education system by economic zones is based on the official statistical data from the Regional Office of the Federal State Statistics Service on the RS (Y), data from the Ministry of Education and Science of the RS (Y), data from the heads of municipal districts and principals of educational organizations for the period of 2007-2016, which enabled the authors to obtain methodologically transparent results. These data are reported on a regular basis, which will make it possible to update the values of primary indicators, to continue to build statistical series, and to calculate coefficients characterizing territorial imbalances in the republic in the context of municipal districts of the RS (Y).

6. Conclusion

The assessment of education development in the AEZ allowed for a more accurate description of the current situation in the regional education system, identification of problems, emerging trends, and territorial imbalances in education development in the Arctic Zone, associated with the socio-economic environment in the territory. The developed set of indicators for development of territorial education systems contributed to the detailed analysis and assessment of the object status, taking into account the characteristic features of the area under consideration. The first comprehensive study of the educational levels in this region is not intended to be an exhaustive analysis and an expert assessment. Nevertheless, at the moment, the analysis and evaluation findings allow the regional and municipal education authorities to determine development strategies for the education system, to prepare a roadmap for accomplishment of mid-term and long-term objectives, taking into account the specific Arctic conditions and, based thereon, to forecast sustainable development of the education system in the AEZ of RS (Y) for it to comply with the

provisions of the Strategy of Social and Economic Development of the Republic of Sakha (Yakutia) for the period up to 2030.

Thus, the study materials can be used in the process of developing proposals for making informed and proper managerial decisions by education authorities, given that the low student population and the critically small number of students per class in secondary schools in the Arctic Zone Uluses is a socio-economic pattern conditioned by the natural, climatic, national and regional development features of the Arctic zone of the Republic of Sakha.

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