International Journal of Engineering & Technology, 7 (3.2) (2018) 686-691

International Journal of Engineering & Technology

Website: www.sciencepubco.com/index.php/IJET

Research paper



The Main Approashes for Increasing the Efficiency of the Rural School Network

Olga Tyshkevych[1]*, Aleksandr Obidniy[2]

[1] *Poltava National Technical Yuri Kondratyuk University, Ukraine*
[2] *Poltava National Technical Yuri Kondratyuk University, Ukraine*
**Corresponding Author E-Mail: Olgatyshkevych3639@Gmail.Com*

Abstract

The purpose of the article is to identify the main directions of improvement of the network of institutions of general secondary education in rural areas on the example of Ukraine. The authors developed an algorithm for research, consisting of four stages. During the study, the preconditions for forming a network of rural schools were considered. The following network parameters such as warehouse, spatial structure are found. Based on the analysis of modern socio-pedagogical requirements, the concept of promising organization of school services in rural areas has been developed. It is established that in conditions of rural settlements, it is advisable to form teams for teaching from pupils of different ages (multigrade classes). The authors provided suggestions on the formation of territorial educational districts as a promising direction for improving the network of rural schools. The perspective types of institutions of general secondary education, which are formed on the basis of interagency integration with other objects of cultural and household services of the population, are revealed. To improve the process of designing a network of village schools, the authors developed a methodology for optimizing the network of schools on the basis of linear programming.

Keywords: *rural school, school network, territorial educational district, interdepartmental integration, optimization*.

1. Introduction

Modern socio-economic conditions put forward new tasks to the social institutions of the country, require new approaches to modernization of education and social protection of citizens. In the context of the introduction of continuous education in Ukraine, there is a need to improve the principles of network formation and the buildings of educational institutions. [1-3] This question is especially relevant in relation to rural schools, which make up the majority of educational institutions of the country. The limited access to quality education for children living in rural areas is one of the topical issues in the educational field. [4]

In the total number of institutions of general secondary education, rural schools make up two thirds (11.3 thousand), 1.2 million pupils study. The features of functioning of schools in rural areas of Ukraine are due to their low filling capacity. The average number of students in a rural institution is 102 students (in Chernihiv oblast - 61 students, in Zakarpattya - 177 students), the average number of students in the classroom is 12 students (in Chernihiv region - 10 students, in Zakarpattya - 16 students). The establishments of general secondary education of low filling are distinguished by the higher cost of education, the lack of a sufficient number of qualified teachers, the methodological isolation of teachers, the impossibility of choosing a student of an individual educational trajectory, the inadequate socialization of students. [5,6]

Due to the inefficient organization of the school network, the efficiency of the use of financial resources involved in the provision of educational activities in the rural area is low. This leads to a reduction in the number of schools, a deterioration in the state of their material and technical base, impedes the introduction of modern innovative technologies and training facilities. In order to ensure economic efficiency, accessibility, and high quality of general secondary education, the network of educational institutions should be fully in line with socio-pedagogical, sanitary and hygienic requirements, socio-demographic requirements, conditions of resettlement and cultural and domestic services. [7]

2. Research Methodology

The research is based on a systematic approach that allows us to consider the network of schools as the integrity of hierarchically organized elements.

Methodological algorithm for scientific research consists of stages:

- analysis of the preconditions for forming a network of institutions of general secondary education in rural areas;
- definition of conceptual foundations of promising organization of school services for rural inhabitants;
- development of scientifically substantiated proposals for the improvement of the network of rural schools;
- development of a methodology for calculating the network of institutions of general secondary education in rural areas.

For the analysis of the preconditions for the formation of rural schools, methods of statistical and factual analysis of literary sources, design documentation on the subject of research, field surveys and photos of available school buildings were used. This provided an opportunity to establish data on the composition, structure, spatial characteristics of the existing network of rural schools. Modern pedagogical research, experience of innovative pedagogical activity was studied to determine the conceptual foundations of organization of school services in rural areas. In

Copyright © 2018 Authors. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

this case, methods of qualitative, quantitative, comparative analysis were used. The methods of structural-functional and graph-analytical modeling were used in developing proposals for promising network organization. The method of experimental design was used to formulate proposals for the organization of the network in specific urban planning conditions.

Problems of the formation of educational institutions in different years were studied by Kovalsky L.M., Urenov V.P., Sarkisov S.K., Stepanov V.I, Svitko V.A, Antoshkin V.F., Reshetnikova N.V. Features of functional-planning decisions of school buildings are considered in the works of Klochko A.R., Korovina O.A., Svendsen D.L. and others. The problem of school buildings mismatches with new requirements and school services in general has been investigated by Prakash Neiar, Rendall Fielding, S. William Brubaker, Vark Dudek, and others. In these works, the scientists search for new forms of school buildings, as well as new principles for their design and location in the structure of settlements.

3. Prerequisites and Conceptual Foundations For the Formation of a Network of Rural Schools

There are more than 13,300 day schools of general education in the countryside of Ukraine, which is 68% of the total. More than 1.2 million students study in them (34.3% of the total number of students). Modern rural schools of Ukraine are distinguished by a small number of students. This is due to the unfavorable demographic situation, the migration of rural families to cities. Since the early 90's of the twentieth century, there has been a reduction in the number of pupils in rural schools, the average filling of elementary, primary and secondary schools. In the districts in question, the average filling of elementary schools is 6-11 students, the incomplete secondary - 36-72, and the secondary - 100-148 students. [4]

The analysis of the existing school buildings fund, which was formed predominantly from buildings of 30-70 years of the twentieth century, revealed their noncompliance with modern socio-pedagogical requirements. The main disadvantages are the lack of facilities for sports education, the lack of space for classrooms and for the use of technical means of training, lack of space or lack of food units, the lack of properly equipped sleeping rooms and play rooms. As a result of the analysis it was found that more than 30% of existing school buildings require replacement, and in about 2,000 rural settlements, the opening of general education institutions is required.

The initial conditions for the functioning of the system of school services in rural areas are legally established provisions regarding the integrity and continuity of the education system; compulsory full secondary education; the unity of education, upbringing and development; the availability of all forms and types of educational services provided by the state. [1-3]

The modernization of the network of rural schools should be aimed at improving the education of the region and ensuring:

- accessibility of education for all children and young people of the region regardless of place of residence;
- the possibility to choose institutions of general secondary education;
- improving the quality of educational services, the efficiency of the educational process;
- variability of educational services taking into account individual inquiries;
- the diversification of the forms of organization of the educational process;
- creating conditions for the development of the abilities of each child, as well as for the education of children with special needs;
- compliance with the requirements of economic expediency and efficiency of educational institutions in the region;
- rational concentration and effective use of material, financial, human resources;
- shortening the length of time for children to enter general secondary education. [1-3, 8]

The analysis of modern research in the field of formation of educational systems of the rural region, pedagogical technologies of a small-scale school, foreign experience in the construction of rural schools has allowed to identify fundamentally different approaches to improving the network of rural schools. By way of organizing logistical and human resources, they can be divided into the following:

- measures based on concentration of resources; [10,11]
- measures on the basis of co-operation of resources. [5,7,9,11].

Measures based on the concentration of material and technical and personnel resources of educational institutions include:

- network organization based on types of school buildings of large capacity,
- consolidation of existing rural secondary schools with the organization of transportation of pupils,
- expanding the coverage of children in boarding schools. [10]

The placement of a school in transport accessibility from the student's residence will have negative socio-economic and socio-pedagogical consequences, namely:

- will encourage rural inhabitants of working age to leave their place of residence and to seek employment and housing in settlements where there are general educational institutions;
- will lead to the impoverishment of the village;
- will reduce the cultural-educational, educational functions of the school;
- will substantially complicate the work with the parent community;
- will cut down on the child's participation in extracurricular and out-of-school work;
- will increase the risk of morbidity among children, which will result in occupational omissions;
- will cause unemployment of teachers [5].

It is necessary to add that pupils' transportation to school requires significant material and financial support, the availability of hard-coated roads, sufficiently high quality of the fuel vehicle fleet and the introduction of two full-time teachers of the payroll teacher who will accompany the children during transportation [7]. In rural settlements of Ukraine, measures based on the concentration of resources that provide for the elimination of institutions of general secondary education do not fully address the problem of the effectiveness of the school network. Given the regulatory time availability in most administrative regions of such areas as Poltava, Chernihiv, Kharkiv, and Sumy, with a large number of small and medium-sized villages, the consolidation of schools will not allow for the expected economic effect - the number of establishments of general secondary education of low filling will remain high. Taking into account the above, it is possible to conclude that the widespread use of school management services based on the concentration of resources is not feasible.

The problem of improving the quality of services and access to quality education in rural areas can be addressed by consolidating resources within a group of schools. The idea of cooperation of resources of small-scale educational institutions in rural areas on the basis of a secondary school is relevant in the current conditions of the crisis situation in the social sphere, the limited financial, personnel and material resources that exist at the disposal of the education system. [5,9,11]

Institutional integration of rural schools is aimed at solving their particular problems:

- acute needs of rural schools in additional sources of financing;
- the need for a school with a small group of students in expanding the educational space;
- absence of the choice for a village pupil of an educational institution, a teacher, a low overall cultural and educational level of parents, the limited socio-cultural sphere of the village;
- modernization of modern education;
- insufficient number of out-of-school establishments, institutions of additional, primary and secondary vocational education [5].

Measures based on the principle of co-operation of resources include the integration of educational institutions with cultural and educational institutions, health care institutions through the development of relations between them, the formation of a unified management infrastructure, the distribution of material and technical resources, human resources, information and methodological support. They stipulate:
- acute needs of rural schools in additional sources of financing;
- the need for a school with a small group of students in expanding the educational space;
- absence of the choice for a village pupil of an educational institution, a teacher, a low overall cultural and educational level of parents, the limited socio-cultural sphere of the village;
- modernization of modern education;
- insufficient number of out-of-school establishments, institutions of additional, primary and secondary vocational education [5].

Measures based on the principle of co-operation of resources include the integration of educational institutions with cultural and educational institutions, health care institutions through the development of relations between them, the formation of a unified management infrastructure, the distribution of material and technical resources, human resources, information and methodological support. They stipulate:
- the introduction of multi-year training, which stipulates a change in the principle of staffing the student team through the formation of classes from close-to-age groups of students instead of traditional single-parent;
- the construction of a network of comprehensive educational institutions based on territorial educational districts from the main secondary educational institutions, which are the centers of educational, organizational-methodical, physical culture and sports work, and magnetic secondary schools that carry out their activities, consolidating with supporting ones;
- the development of integrative models of educational institutions that combine a general educational institution with other educational institutions and social institutions in order to implement effective educational activities. [5,7]

The introduction of multi-year training involves changing the mechanisms of formation of the classroom in the school of II and III degrees. In this class, one teacher conducts classes with different age-dismissed students. It is advisable to create a combined class (classes-sets) of two classes, the number of students in this class should not exceed 25. In exceptional cases, the formation of three-class sets of classes is allowed, the number of students in each of which does not exceed 15. In the initial it is possible for the school to create four contiguous sets of classes with a number of students up to 10. For pupils of the second and third grades, it is advisable to combine adjacent classes, for example, V-VI, VII-VIII, XI-XII. For the elementary school, the combination of I-IV, II-III grades is optimal. There may be alternating classes [5,6].

The implementation of multi-year education will solve a number of psychological and pedagogical problems of a small-scale rural school, namely:
- expansion of the educational space of students' learning activities;
- students' interest in learning;
- mastering of independent forms of work;
- activating cognitive activity of students.

Such an event will have significant economic benefits due to the association of students in classes – kits. While preserving previous amounts of funding released funds can be used to improve the material and technical base, extra-curricular work, extracurricular education. [5]

Formation of the system of general secondary education in rural areas is expedient to organize on the basis of multilevel interaction of educational institutions, through the formation of territorial educational districts. Educational district is a set of educational institutions (their affiliates), including out-of-school educational institutions, cultural establishments, physical culture and sports, which provide access to education for persons residing in the respective territory. Functioning of institutions of general secondary education in the structure of the district causes the development of relations between them, the formation of a unified management infrastructure, the distribution of material and technical resources, human resources, information and methodological support. [8]The purpose of the establishment and activities of the district is:
- provision of children of preschool age, pupils (pupils) of educational institutions of the system of general secondary education with equal access to quality pre-school, general secondary, extracurricular education, pre-vocational training, continuing education in service areas;
- coordination of the activities of educational institutions, institutions of culture, physical culture and sports, health care and others in the district on the implementation of education legislation, the effective use of human resources, teaching and methodological, material and technical basis. [11]

4. Proposals for the Organization and Calculation of the Network of Rural Schools

It is expedient to plan the education system in rural areas on the basis of measures based on the principle of cooperation of resources. In the conditions of limited financial, personnel and material resources, it is expedient to organize a school network based on the formation of educational districts and the integration of institutions of cultural and domestic services. The formation of territorial educational districts is aimed at solving the problem of the effectiveness of educational services, through the consolidation of resources within a group of schools.

Depending on the area served, the constituent entities of the district are expedient to form the following associations: the School District (SHOO), the Intercultural Education District (MSKO), the District Education Districts (ROO) and the Interregional Educational District (MROO).

The school educational district (SHOO) is the lowest-level educational association. It is formed from the institution of general secondary education of the I-III degree, institutions I, II-II degrees. The school educational district is established within the limits of pedestrian or transport accessibility to the institution of general secondary education of I-III degree, which in this association is the reference institution.

The Intercultural Education District (ILC) is a higher education institution. It is formed from the basic institution of general secondary education of I-III degree, institutions I, I-II, I-III degrees. Within the boundaries of the intercultural educational district there are limits to transport accessibility to the I-III level support institutions.

Importance of development of such spaces is repeatedly underlined by scientists that try to find principles and means of their organization in accordance with the modern level of urban culture of XXI century. Comfort and attractive space must have the functionally reasonable planning, original designer conception keeping in mind the ecological constituents, ergonomics parameters, intercommunication with the town-planning system. Because in our time such spaces serve not only as urban interior spaces but also as a platform for environment experiments, related to integration of natural elements, to approbation of modern technological novelties. Landscape compositions, elements of urban design, sculptural-decorative and supergraphic compositions, street furniture and advertising media, system of visual communications and various temporal installations participate in their development. Such spaces must be accessible for all habitants of a city. The important aspect of their availability for all categories of population is their barrier-free structure. The structure of the new urban linear landscape spaces includes rampants, escalators, lifts, movable sidewalks that give an opportunity to create the high-comfort space for the physically challenged people. Thus, good implementation of such spaces is the result of collaboration of different spheres of design - urban, landscape, ecological, ergonomics and graphic.

The District Education District (ROO) is the best educational institution in the countryside to provide rural residents with high-

quality pre-school, primary, basic, secondary education, primary vocational education. [11]A district educational district should have several basic education institutions. It is calculated on the number of students living within the radius of transport accessibility to the base schools. Typically, the boundaries of the district educational district coincide with the borders of the administrative district.

The main structural elements of educational districts are magnetic and reference schools. The reference educational institution is an institution of general secondary education, which has a convenient location for the transfer of children from other settlements, is provided by qualified pedagogical staff, has a modern material and technical and educational and methodological base and is able to provide the appropriate level of specialized education. [8]

The lowest link in the structure of the school network is institutions of general secondary education of the 1st level (elementary schools). The presence in rural areas of the children's place of education of an educational institution that would provide elementary education is compulsory. [9] Primary schools may function in rural areas if there is no opportunity to organize I-II or I-III degrees. Establishments of general secondary education of the first degree are economically ineffective, therefore, when forming a school network, the use of schools of this type should be limited. [8,9]

For the organization of the network, the use of magnetic institutions of general secondary education of I-II degrees and I-III degrees is widely recommended. Such schools provide primary, basic and profile secondary, extracurricular education, carry out social and cultural services for the population.

Supporting institutions of secondary education I-III mainly operate similar to magnetic, but they are relative to the magnetic school districts have educational resource. Supporting schools provide advisory - methodical help teachers carry out extracurricular activities, courses, training sessions corresponding to their specialization, provide teaching and learning literature magnetic School. [11]

Forming the school network based educational districts makes its decision as a single interconnected system within the administrative area. With its organization it is important to ensure a uniform placement of basic education institutions in the district educational district.

In determining the future structure of the school network should take into account the characteristics of the existing network of secondary education institutions of cultural and community services and the factors affecting it, promising change in the settlement system, traffic infrastructure area, the number and population of rural areas, intensity economic, transport links. [10]

The calculation of the network is carried out on the basis of real indicators of the existing and perspective children's contingent, which will determine the capacity of school buildings and the number of students' groups. The estimated number of pupils in secondary education is determined by taking into account the number of children in the village where the school operates and the number of children in the villages served by this school. In the countryside, it is planned to host schools for elementary school students within a radius of pedestrian accessibility, which should not exceed 2 km. Under the conditions of transport, students of this category should spend up to 15 minutes on the way to school. For this time of movement will correspond (depending on the class of roads and taking into account the expectation of transport) distances: for roads of regional significance at speeds of 30 km / h - 5 - 6 km; for roads of rayon significance at a speed of 20 km / h - 4 km. Pupils of institutions of general secondary education of II and III degrees have to spend on the way to school no more than 30 minutes. In the conditions of transport accessibility, depending on the class of roads, this indicator will correspond to a distance of 8-15 kilometers. [10]

For the organization of the network of rural educational institutions, it is expedient to apply multifunctional types of school buildings, which are formed on the basis of inter-departmental integration of the institution of general secondary education and other institutions of cultural and household services of the population. The effectiveness of such measures is confirmed by domestic and foreign experience of multifunctional rural public buildings. The establishments with which the integration of educational institutions is possible should meet the requirements of social and pedagogical expediency, compatibility of functional processes, the presence of identical premises and conditions for the creation of universal spaces, the unity of the three - dimensional planning structure and constructive systems, the possibility of combining flat structures. [12-14]

Integration of the institution of general secondary education with the institution of preschool education is especially relevant in conditions of low school filling. It allows to improve the quality of educational process, promotes the involvement of children 6 years of age, ensures the continuity of the content of education and upbringing of children of preschool and school age, creates family atmosphere in the institution, promotes the preservation of children's health. [5] In rural settlements, it is advisable to integrate pre-school establishments not only with elementary schools, which is provided by the current normative requirements, but also with institutions of general secondary education of I-II and I-III degrees. [13]

The consolidation of institutions of general secondary and extracurricular education increases the efficiency of their educational activities, the level of socialization of rural students. The use of integrated training programs forms a mode of work based on the maximum benefit for the health of children, contributes to the growth of their creative and search activity. When calculating the number of out-of-school educational establishments, it is important to foresee the possibility of reaching all those who wish this education. [7]

When building a school network, it is necessary to provide teachers with housing. This will help solve one of the main problems of the system of school services in the countryside - the availability of teaching staff. The effectiveness of combining the school with housing is determined not only by reducing the cost of construction and operation, but also the rationalization of the teacher's non-working time. Particularly effective are such measures for elementary schools. In rural areas, an elementary school that integrates with a teacher's home may at the time of extracurricular activities serve as a center of leisure, a branch of a rural library. In order to create appropriate living conditions for families of teachers, the inclusion of residential cells in the structure of buildings of institutions of general secondary education of I-II and I-III degrees is inappropriate, apartments for teachers can be provided in residential buildings near the school site. [13,14]

The need to meet the socioeconomic needs of the agrarian and social spheres in the specialists who do not require special vocational education (builders, sellers, turners, locksmiths, seamstresses, workers of mass occupations in agriculture), stipulates the preservation and development of vocational training of pupils of the IX - XII classes . In order to effectively organize vocational education of upper secondary school students in rural areas, it is possible to integrate a general secondary education institution with an institution of initial vocational education - rural school educational and production workshops. The expediency of integrating a school with an institution of initial vocational education is due to the presence of joint groups of premises - the functional structure of school educational and production workshops consists of educational, production, administrative and household facilities. [5,7]

The interagency integration of institutions of general secondary education with cultural-entertainment and leisure establishments, the number of which in rural settlements decreases from year to year, is actual. [4] Under these conditions, the school becomes the center of cultural and educational work and actually serves as a social and cultural center of the village. [5,7]

The integration of the school with the sports complex will contribute to the expansion of the network of sports facilities, coverage of the rural population by sport and health work, will provide the material and technical base for the implementation of the general education program on physical education. The sports complex,

which includes a gym, a swimming pool with auxiliary facilities, can be visited by students as well as adults. [12-14]
Taking into account the preconditions for the integration of the institutions of cultural and household services, the following main typological groups of multifunctional school buildings can be used to form a school network in rural areas of Ukraine:
- socio-cultural center (a magnetic or basic institution of general secondary education, a preschool institution, a leisure facility, institutions of extracurricular and primary vocational education);
- cultural and educational center, (a magnetic institution of general secondary education, a leisure facility, a library, a museum);
- educational complex (magnetic institution of general secondary education, institutions of preschool and institutions of extracurricular education);
- educational and sports complex (foundation of general secondary education, institutions of extracurricular and primary vocational education, physical culture and health institution). [13]
Optimization of the network of objects of the school network consists of choosing the optimal capacity depending on the system of resettlement and the number of school contingents in individual points based on the modification of known mathematical methods.
Nowadays, methods of optimization are actively used in many spheres of urban development: design and analysis of systems of cultural and household services, planning of development, organization of networks of objects of public service, etc. Despite some traditionality of the issues of optimization, there is always a need for further development of this direction, which is due to the emergence of new practical tasks.
The term "optimization" refers to the process or sequence of operations that allow a better solution. The statement of the optimization problem involves determining the optimality criterion, optimization parameters and constraints. The criterion of optimality determines the features on the basis of which a comparative estimation of admissible solutions is made and an optimal choice. The optimization options are independent variables that completely and uniquely determine the solvable task. Restrictions determine the relationship between the parameters that should be taken into account when solving a search. The criterion of optimality may be the requirement to achieve an extreme (largest or smallest) value of one or more functions of the optimization parameters, which reflect the quantitative measure of achieving the objective of optimization of the object under consideration. Each of these functions is called a target. If the target function (TF) is unique, then the optimization problem is called the problem of mathematical programming, and in the other case the problem of multicriteria (vector) optimization. When optimizing the school network, the method of Sarkisova S.K. was used. [10]
In solving these problems, there are the following groups of variables: the number of pupils living in "j" districts and those attending schools located in "i", the capacity of schools and the corresponding consolidated costs for one place, as well as transportation costs associated with moving students.
Given the degree of probability of the implicit now actual source information, we can consider it sufficient at this stage of the study to replace the nonlinear function with a linear one. In this way, the task is to determine the optimal capacity and optimal transportation plan and can be solved by modifying linear programming methods, which is important in terms of wide practical implementation of the model. Most likely, the number of places in schools in a district will not meet the need for them. In order to prevent the overflow of classes, it is necessary to exceed the total capacity of schools over the need in student places. So, in general terms, we use an open model of transport task. However, for the convenience of solving through the introduction of a fictitious point, we reduce the problem to a "closed" form, that is, to the point where the total number of students in the city will correspond to the total capacity of all schools in the city in question. To solve the problem, we will make a model. Let's take note of the given values:
Aj - the number of students at the "j" point (j = 1, 2, ..., n);
Mik – the version of the capacity of the pulleys, placed at the point "i" (and = 1, 2, ... m);
Cik - the combined unit costs for the version of the capacity of the school at the point "i" (specific operating costs plus capital investments, multiplied by the coefficient of economic efficiency); in the conditions of the formed network, the liquidation surplus is introduced here;
This is the transport costs of moving one student from the "j" point to "i".
Unknown values:
MI opt - the optimal variant of the capacity of a school building at the "i" point (from the number given);
Xji is the number of pupils transported from the "j" point to "i".
Limit variables:

$$\Sigma \text{ Mik} = \Sigma \text{ Aj}; \quad (1)$$

i j

$$\text{Xji} \geq 0 \quad (2)$$

Optimality criterion:
n m n

$$\Sigma \Sigma \text{ Cji Xji} + \Sigma \text{ Cik Mi opto} \rightarrow \text{f [X] min} \quad (3)$$

j = 1 and = 1 and = 1
The criterion for optimality of the model is the minimum of the total cost of organizing a system of secondary education in a given settlement. This includes expenses for the training of students, for the expansion, construction and elimination of school network facilities and transportation costs, etc. In addition, a number of conditions or restrictions in the form of pedagogical, hygienic and other requirements of the educational process are put forward while solving problems.

5. Conclucions

As a result of the research, it was established that the existing network of rural schools has a multi-level structure and consists of autonomous institutions of the I-III grades, I-II degrees and I degree. A significant number of rural schools has a small number of students. This makes the network of rural schools ineffective. The structure of the existing network of rural schools and school buildings has the following disadvantages:
- absence in rural settlements where there are children, establishments of general secondary education;
- finding a significant number of settlements out of transport accessibility to schools;
- functioning of rural schools in the mode of organizational isolation,
- inconsistency of the existing fund of school buildings with modern socio-pedagogical requirements.
Based on the study of the preconditions for the formation of the school network, it was discovered that the main factors influencing its organization are social-pedagogical as well as architectural and urban development ones. The analysis of socio-pedagogical prerequisites allowed to identify perspective directions for improving the network of villages in urban planning conditions in Ukraine:
- the introduction of a multi-year training, which involves the formation of a class of two different age groups of students;
- formation of a network of educational establishments based on educational districts, associations of general educational institutions of different types with pre-school, out-of-school and other educational institutions;
- development of integrative models of educational institutions, which are formed due to the integration of general educational institutions with other objects of public service.
It is proposed to create a network of schools in rural areas as an integral hierarchical structure within the administrative district based on school and intercultural educational districts. The peculiarities of formation and types of educational districts are revealed.

The school educational district is organized from the support institution of the I-III grades and magnetic institutes of the I-II, I degrees. The inter-school educational district is formed from the reference institution of the I-III degrees and magnetic institutes of the I-II, I degrees. The maintenance area of the intercity and school educational district is determined by the radius of transport accessibility of the reference general educational institution, which should not exceed 15 kilometers.

During the study we found establishments, integration with which is appropriate for the school; they are a preschool institution, cultural and educational institutions, the institution of initial vocational education, sports facilities. Depending on the type of institutions being integrated, the types of school buildings are proposed - the sociocultural center, the cultural and educational center, the educational complex, the educational and sports complex, the educational and residential complex.

An effective method of improving the efficiency of networks of cultural and domestic services is their optimization. Appropriate mathematical methods for optimizing the network of rural schools are methods of linear programming. This approach allows you to get the best option for the location of school objects from all possible options. This involves achieving the highest efficiency with minimal costs for building a network of school facilities. As a result of the study the construction of a mathematical model is proposed, which involves the following steps: the definition of task variables; definition of the target function; defining constraints on parameters.

References

[1] *On the National Doctrine of Education Development: Law of 17.04.2002 / № 347/2002 //* Database "Legislation of Ukraine" / The Verkhovna Rada of Ukraine. URL: http://zakon3.rada.gov.ua/laws/show/347/2002 (application date: Apr. 03, 2018)

[2] *About education: Law from 09.05.2017 № 2145-VIII //* Database "Legislation of Ukraine" / The Verkhovna Rada of Ukraine. URL: http://zakon2.rada.gov.ua/laws/show/651-14 (application date: Apr. 03, 2018)

[3] *About general secondary education: Law of May 13, 1999 / № 651-XIV // Database "Legislation of Ukraine" /* The Verkhovna Rada of Ukraine. URL: http://zakon5.rada.gov.ua/laws/show/651-14 (application date: Apr. 03, 2018)

[4] *Socio-economic situation of rural settlements of Ukraine: Stat. Collection /* State Committee of Statistics of Ukraine. - K .: State Statistics Committee of Ukraine, 2016 – 187p.

[5] Guryanova M.P. *Reserves for the modernization of the rural small-scale school in Russia:* Method. manual / Guryanova MP .- M.: IPSR RAO., 2003.-198 p.

[6] *Rural school: socio-pedagogical factors of education and upbringing: Monograph* / Pod. Ed. GI Reprints - M.: Ippraa, 2005. – 96p.

[7] Guryanova M.P. *Restructuring of the network of general educational institutions of the village /* MP Guryanova, V.B. Orlov - M.: Publishing-house of IPSR RAO, 2003.-93 p.

[8] On Approval of the Provision on the Educational District: Resolution of the Cabinet of Ministers of Ukraine of 27.08.2010 / № 777 // Database "Legislation of Ukraine" / The Verkhovna Rada of Ukraine. URL: http://zakon3.rada.gov.ua/laws/show/777-2010-%D0%BF (Appointment Date: Apr. 03, 2018))

[9] Dollars and Sense: The Cost Effectiveness of Small Schools./ [Bingler, Steven; Diamond, Barbara M .; Hill Bobbie; Hoffman, Jerry L .; Howley, Craig B .; Lawrence, Barbara Kent; Mitchell, Stacy; Rudolph, David; Wash] .- KnowledgeWorks Foundation, Cincinnati, OH; The Rural School and Community Trust, Washington, DC; Concordia, LLC, New Orleans, LA, 2002. - 31p.

[10] Sarkisov S.K. Optimization of the network of school buildings: author's abstract. dis for obtaining a scientific degree. architect. Spec. 18.00.02 "Architecture of buildings and structures" / S.K. Sarkisov - M., 1974 – 31p.

[11] Osadchy I.G. Education of the Rural Region: Theory and Technology of Development Management: Monograph / Osadchy I.G. - K .: School World, 2005. – 260p.

[12] Svendsen G.L.H. Multifunctional centers in rural areas. / Svendsen G.L.H. . - The Danish Institute of Rural Research and Development, University of Southern Denmark, Esbjerg, 2009 - 31 p.

[13] Tishkevich O.P. Architectural-planning organization of rural small schools: author's abstract. dis for obtaining sciences. Degree Candidate Architects: specials. 18.00.02 "Architecture of buildings and structures" / O.P.Tishkevich. - K., 2010. – 21p.

[14] Bulgakova E.A. Features of the formation of the architecture of rural small schools: author's abstract. dis for obtaining a scientific degree Cand. Architect: Special 18.00.02 "Architecture of buildings and structures. Creative Concepts of Architectural Activity "/ E.A.Bulgakov. - M., 2006 – 20p.