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EDUCATION MONITORING AS A PROGNOSTIC BASIS FOR ITS STRATEGIC DEVELOPMENT

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Abstract

The authors provide an analysis of the problem solution for constructing an education reality for the purposes of strategies development based on indicators of education systems monitoring. First of all, it was necessary to form an array of key indicators as a prognostic basis for determining the strategic development of national education systems. To solve this problem, various methods were used: descriptive, comparative, temporal, correlation, prognostic, etc. As an example of the results, a table of composite indices with administrative levels of monitoring and strategic decision making is presented. The development strategy of Global Education for 2030 led to the transformation of national monitoring systems. A model of global education 2030 is also described as an example of the number of functional literacy kinds necessary for a student. The empirical part of the study is presented: a) forecasts of the levels of education based on monitoring of various types; b) categorization of monitoring indicators characterizing schoolteachers. Variable strategic development forecasts consist of indices and rankings used in the global educational space. The authors show the necessity to calculate these indices independently for federal districts and regions, for urban and rural schools, etc. Findings include certain practical recommendations for the improvement of the education systems monitoring procedures.

Keywords: Monitoring, prognostic, strategic, global, indicator, indices.

1.   Introduction

If we teach today's students as we taught yesterday's, we rob them of tomorrow..

John Dewey

It is education, that is, pedagogy as an interdisciplinary science (Youngblood, 2007), that influences seriously our future. The one who comes to school in 2019 (Young et al., 2016) will finish it in 2030 and will choose the path for his/her future life. Therefore, we should start planning this future already today; otherwise, as Dewey wrote (see the epigraph), we will lose this future (as cited in Rogacheva, 2013).

In order to construct strategies for the development of education, it is necessary to take into account many factors and consider development strategies, both globally (Leask, 2014) and nationally (UNESCO, 2017). To this end, it is necessary to rely on a certain foundation, in which the results of monitoring (European Commission/EACEA/Eurydice, 2018) and examination (York, Gibson III, & Rankin, 2015). of national education (Naydenova, 2016) are used as education. It is the indicators of monitoring the education system (OECD, 2018b), that will constitute the factual predictive basis of development strategies (Dolganovskaya & Katicheva, 2014).

Proper selection of monitoring indicators, preferably objective (Rudneva & Rubcova, 2018), measured (Naydenova, 2015) and evaluated (Glebova, Kuznecova, & Shadrikov, 2012), has become a problematic goal of this study.

2.   Problem Statement

The statement of the problem for this study was determined primarily in the framework of the designed educational space. Any educational space, including the world educational space (Rassulova, 2015), is formed every time in its own way: depending on the subject, educational environment (Janova, Adolf, & Ignatova, 2012), standards of training and assessment, curricula, qualifications of teaching and administrative staff, funding, etc.

Therefore, the problem of constructing an educational space is relevant for achieving the goals of strategic development of education declared in the world: Education 2030 (OECD, 2018a); the fourth Goal for Sustainable Development (UNESCO. Institute for Statistics (UIS), 2017); Education monitoring (Borovkova & Morev, 2004); indexes and rankings of educational systems (Indeksy I indikatory chelovecheskogo razvitiya. Obnovlennye statisticheskie dannye, 2018) and others.

The prognostic basis for planning the strategic development of education is determined by the data collected in the monitoring mode of the education system. Different monitoring indicators (observable, calculated, measurable) reflect educational reality (Naydenova, Shaposhnikova, Zianshina, & Myasnikov, 2018). The designed educational reality (Naydenova et al., 2018) is constructed as a result of selecting different types of monitoring indicators, while a separate array, which will determine the further prognostic analysis of the strategy for the development of education, is specified for this purpose. Therefore, different arrays will give different constructs of educational reality. The problem is to find

something common in all these constructs, which can be considered a predictive monitoring basis for the strategic planning of the national education system development.

Consequently, the problem of constructing an educational space can be solved by integrating selected indicators of education systems monitoring.

3. Research Questions

The study of the multifaceted integration of global and national indicators for monitoring formal and non-formal education is assumed to be among the key research questions.

In accordance with the problem stated, the following questions were posed in order to be considered during the research:

1. What indicators will be selected for the prognostic basis? Statistically observable indicators for different levels of learning were selected as such indicators.

2. What method should form an array of indicators for the prognostic basis? As the main method, factor analysis was chosen in order to compress information and form integral constructs.

3. How will monitoring indicators be included in prognostic equations? The hierarchical linear modeling method was chosen as indicators for inclusion in the prognostic equation.

4. Purpose of the Study

The main objective was to develop recommendations for the formation of a set of federal monitoring indicators with a view to filling out the factual definition of strategic educational development in the country in accordance with national and international trends. First of all, the strategy for the development of global education through the international monitoring of the quality of school education was reviewed.

Since the problem and research questions required the inclusion of a factor reducing the number of indicators, one of the goals was: a) taking into account the temporal correlation between monitoring and development strategy; b) comparative analysis of global and national trends in the strategic development of pre-university education; c) a descriptive analysis of monitoring forms for building a prognostic basis.

5. Research Methods

The main methods for solving the questions posed were: 1) methods of working with large amounts of data and their compression by the method of principal components; 2) comparative methods, including dispersive and correlation analyzes; 3) the method of examination of the results of monitoring studies; 4) prognostic methods; 5) invariant methods of strategic forecasts.

6. Findings

In accordance with the purpose of the study and the theoretical and empirical research methods chosen, the following topics were considered:

1. Designed educational reality through the indicators of monitoring of education systems.

2. Strategy for the development of global education in the transformation of national monitoring systems.

3. Global trends in national strategies of different countries: comparative analysis.

4. Selection of key indicators and monitoring indicators for the construction of predictive trends.

5. Varying strategic development forecasts: indices and rankings.

6.1. Designed educational reality through the indicators of monitoring of education systems.

The constructed educational reality through monitoring indicators has factual and temporal characteristics. That is, the educational space of the country is being formed with the following stratification variables: a) districts and regions; b) city and village; c) languages of instruction; d) types of institutions; e) educational achievements, etc.

In contrast to the theoretical model of the constructed educational reality, the authors build the educational space through the prism of federal indicators in the international mirror. In addition, this space is statistically observed. It does not have a continuous length in time and volume, since there are only shear data for years and for certain types of observed indicators.

At the same time, as a result of the integration of indicators, composite indices are formed (see Table 01).

Table 01. Composite indices of the designed education reality according to the management levels

Indices types	Outside the system of education	Federal	Regional	Intra institutional
Context	√ 7	√ more than 7		
Input		√ 11	√ more than 11	
Procedural			√ 11	√ more than 11
Output		√ 17	√ more than 17	

From Table 1 it follows that the composite indices for selection into the primary array of monitoring indicators to construct development strategies are formed not only at the levels of education, but also at the management levels. The figures are given only for the top level of operationalization and indicate the number of primary indicators included in the composite index. At a lower level, the number of primary indicators is always higher.

Context indices describe the external environment in which educational activities are carried out outside the education system: additional education, family education, online education, etc. Input indices describe the human and material resources necessary for the functioning of the education system and the achievement of strategic goals. Procedural indices reflect the organizational structure, for example, the average learning time per student of a certain age or year of study. As a rule, this index is calculated on the basis of the indicators observed and measured in a special mode. Therefore, their level of operationalization is intra-institutional and regional. Output indices work on those administrative levels as input. The differences are that the input indices correlate strongly with the context indices, and the output indices correlate with the procedural ones.

This model of strategy for the development of education through monitoring indicators is called CIPO or the context model and is used in the EU (Scheerens, 2015).

6.2. Strategy for the development of global education in the transformation of national monitoring systems

The development strategy of global education for 2030 led to the transformation of national monitoring systems. The vector of transformations is determined due to the fact that planning strategic development paths, it is necessary to take into account not only factors, indices and indicators (let us call them components) of monitoring over several years, but also include risk analysis (Bebenina & Elkina, 2017). Conventionally, this can be written in two logical statements:

1. If the analysis of the monitoring components is evaluated together with possible risks, then the output indices should be analyzed together with the risks at this level of management decision making.

2. Then the factors of strategic development of education based on monitoring data are analyzed together with the risks that may arise in the future, which will lead to the definition of a specific objective development strategy without unnecessary risks arising at each stage of the CIPO model.

It turns out that it is not so much to consider the development trends, as to include analytics of possible risks (OECD, 2019).

Therefore, global and national risks are included in the monitoring.

The model of global education 2030 is presented in Fig. 1. The student is at the center of the model and should be functionally literate in four areas.
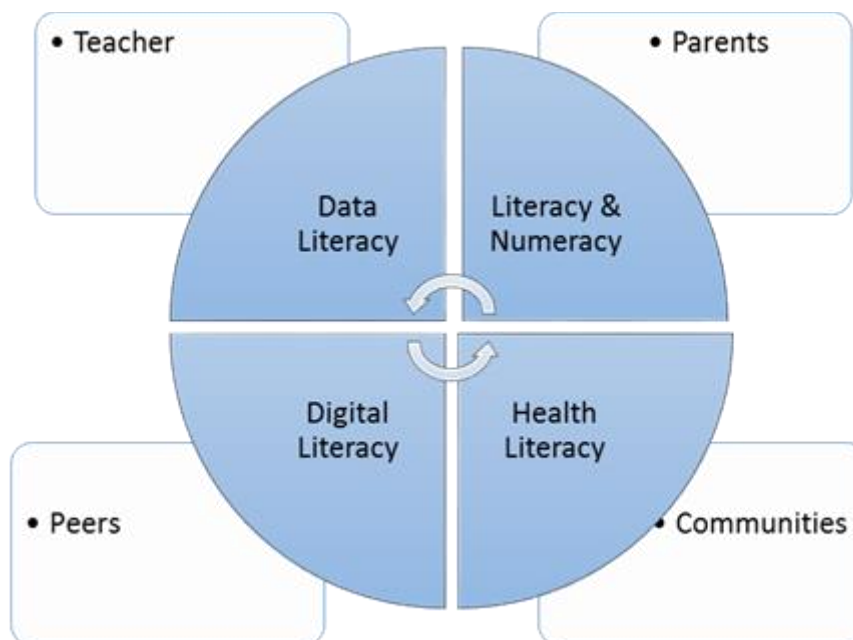

Figure 01. Education 2030 – literacy model.

At the same time, the formation of these competencies is carried out from different subjects: parents, teachers, communities, peers.

By 2030, the concepts themselves will change. So, competences are knowledge, skills, attitudes and values. Knowledge will be subject, interdisciplinary, epistemic, procedural. Skills develop at levels: cognitive and metacognitive, socio-emotional, physical-practical. Levels of relationships and values are: personal, local, social, global.

A student should be able to create new values; take responsibility; reconcile tensions and resolve dilemmas; be a team member and be able to work independently. By the way, the student owns all kinds of literacy at the level of expectations, actions and reflection.

Virtually all economically developed countries form their 2030 strategies along the same lines.

Thus, the transformation of national monitoring should already include a number of indicators in order to build a predictive basis for finding national development strategies.

6.3. Global trends in national strategies of different countries: comparative analysis

3. Global trends in national strategies of different countries are present in different aspects. For example, a number of countries incorporate monitoring research into their strategies, including global and local risks. For example, in the post-Soviet space in Lithuania, the CIPO model was developed where priority is given to the PISA study for the purpose of examining educational achievements.

In general, national development strategies rely on national monitoring of the educational systems of past years that lack these types of literacy.

The Russian assessment of learning outcomes is substantive, as in most countries. Consequently, monitoring is substantive, and thus the strategy also remains substantive.

Global trends in the development of education are still empirically experimental in most countries. It is difficult to say that the constructed educational reality has become as stated in the global strategy.

Figure 2 shows an example of monitoring different types of different research results: international, national different ways (official monitoring through statistical observation; external - monitoring through external services; traditional - monitoring through the national general examinations and tests; independent - monitoring independent of management bodies education services (on the materials of Natalia N. Naydenova from the Russian experience of multiplex evaluation of the quality of school education).
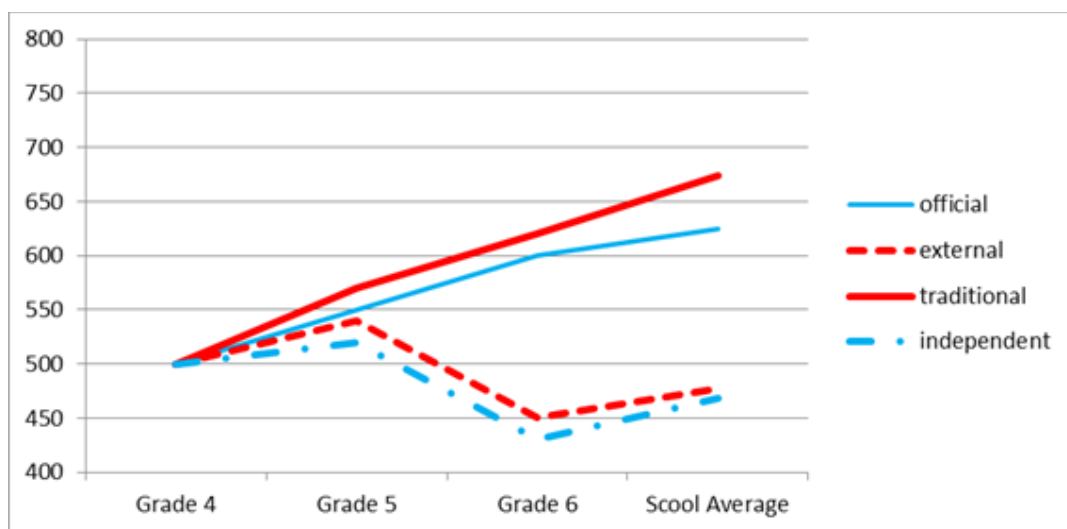

Figure 02. School monitoring by different types.

Data is given in a unified international scale of 1000 points. A single starting point for forecasting is selected for the form IV (the average score is 500).

For the other forms, prognostic equations were constructed. From this forecast, it follows that external and independent monitoring is closer to international results.

It should be noted that, while earlier the monitoring structure changed once every ten years in most countries, now the temporal changes in education systems have sharply accelerated. The national monitoring system is reviewed in some countries once in 5 years, and somewhere in every three years (Singapore, Scandinavian countries, South Korea, etc.).

6.4. Selection of key indicators and monitoring indicators for the construction of predictive trends

The selection of key indicators and monitoring indicators for the construction of predictive trends is carried out at different levels of education. The method of compression of information is used by the method of principal components; as a result factor indexes are calculated. So, of the hundreds of statistical indicators, integral indices are also included in the monitoring. In this case, primary information is collected in the traditional way without verification and examination of the data obtained. Therefore, indices may also acquire a distorting character, despite the consideration of risks and measured indicators with a certain verification on a partial sample from the general population of educational institutions (Ivanova, 2015).

For example, we give a categorization of the indicators characterizing the teacher in Table 2 (Eriksson, Björklund Boistrup, & Thornberg, 2017). The number of indicators in Table 2 is given in the calculated form through integral indices, reduced to a unified scale.

Table 02. Teacher's categorization in monitoring

Categories	Number of indices
General index	13
Professional competences	8
Working conditions	6
Certification index	4
Status	9
The rate of staff members and learners	4

It follows that the integral indices undergo further compression of information.

6.5. Varying strategic development forecasts: indices and rankings

Variable strategic development forecasts consist of indices and rankings used in the global educational space. Among them are the indices of the development of education, human capital, etc. It is necessary to calculate these indices independently for federal districts and regions, for urban and rural schools, etc. At the same time give a breakdown by year and in comparison with other countries.

University rankings are intensively included in the system of international monitoring of higher education, and school monitoring is conducted only in a number of studies and its result can be extended only to the federal level. At the regional level, it is necessary to carry out the research on the representative samples. Of course, this is more than 4 schools per region, but the calculation of a

representative sample for each region differs in the number of schools and depends on the amount of education space at the regional level.

The strategic forecast based on national monitoring studies in Russia practically does not coincide with the international results, both according to the learning outcomes assessment and procedural monitoring issues.

7. Conclusion

Due to page restrictions, we defer proofs of all the results of calculations. However, the following conclusions can be drawn:

1. The education space does not fully reflect the educational reality through monitoring indicators.

2. Designed education space of the monitoring type has the properties of discreteness, length, dimension and temporality.

3. Strategies for the development of education on the predictive basis of monitoring have factual certainty.

4. Monitoring transformations should occur more often, so that the reliability and validity of the data does not become obsolete for building new strategies.

5. Indices and rankings of the international level should be independently calculated for different strata characterizing the development of education in Russia.

Acknowledgments

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