The article describes an approach to assessment of the performance of educational institutions with regard to their social context. To develop this approach, the authors were guided by (1) the results of numerous studies corroborating correlations between student
performance and contextual factors (both in Russia and abroad); (2) the experience of foreign colleagues working with similar problems; and (3) The ideas of availability of a baseline minimum of information required to make these kinds of assessments possible in Russia. The idea behind the proposed assessment model is that with the necessary data consistent correlations between student performance and contextual factors can be empirically identified. Researchers usually establish these correlations using a multiple regression analysis. The results of the analysis, established empirical correlations, may be used to contextualize formal progress (i.e., to adjust expectations for institutions working in more or less favorable conditions). Two possible applications of this information are discussed: one based on a formula and the other on an index specially developed by the authors for measuring school’s social prosperity. Finally, possible constraints associated with these models and the contextual factors for assessing the quality of education in Russia are analyzed.

In spite of its seeming simplicity and obviousness, the problem of assessing the performance of educational institutions by analyzing their operation environment remains unsettled. Several years of research in Russian schools have once again confirmed the link between student performance and external, independent of the school, factors influencing school activity. This connection is the focus of education policy and management strategies worldwide, and applies to Russia as well. The aspects of school’s resources and enrollment are particularly important. And although research results were presented at various public levels, and were discussed professionally,¹ no significant decisions were made on the ground of this research.²

Of the documents governing the assessment of educational institutions, we must first consider “The Plan of Action (Roadmap): Social Changes for Improving the Efficiency of Education and Science” (Decree of the Government of the Russian Federation, December 30, 2012. No. 2620-p), which is meant to “develop and change the performance indicators of government-funded educational institutions, as well as their leaders and primary workers.” “Effectiveness” is constantly heralded as key to both the social and scientific spheres; however, its specific meaning
regarding public education has not been clarified nor has it become a subject of serious discussion—thus, the pedagogical aspect of effectiveness has remained unclear. As a result of the government’s “Plan of Action,” performance indicators were hastily compiled being turned into an eclectic set of rough assessment procedures, which were used to improve the performance of education leaders and workers.

The Decree of the President of the Russian Federation (May 7, 2012. No. 597), “Measures for the Realization of Government Social Policy” proposed that prior to April 1, 2013, “an independent system would be established for evaluating the performance of social service organizations. The system would define the performance criteria of these organizations and include public ratings of their activity” (paragraph 1, subparagraph k).

The actualization of this paragraph triggered an incoordinate search for the criteria of effectiveness without clearly defining the concept first public ratings produced in this work turned out to be more recognizable and “convenient.” They became the foundation of the quality assessment system and eventually replaced the analytical and targeted strategies. The ratings facilitated the maintenance of the initial methods of the national education project: the identification and support of the strongest and most successful educational institutions (usually the ones that possess substantial resources), while ignoring lower ranked institutions, which in reality are the organizations that need qualitative assessment the most in order to identify specific problems and solutions. The simple linear models used to produce the ratings (chiefly based on the Unified State Examination (USE) and the Olympiad programs) do not assess school’s effort or identify the truly effective institutions, which produce the highest possible results given their specific conditions.

the effectiveness of educational organizations) and strengthening
the operations of the education system by improving the quality
of administrative decisions.”³ A catalogue outlining what aspects
of the education system should be monitored includes data on
school resources; however it lacks essential metrics related to the
student enrollment. This approach significantly limits the ability
to achieve the declared objective of “improving the quality of
administrative decisions.”⁴

In practice, the evaluation of schools and their administration
still suffers from the following problems:

- the differences in available resources are not taken into
  account, nor are the characteristics of different student
  bodies;
- the focus remains on top ranking schools, while outsiders
  remain beyond the purview of education authorities;
- the investment and efforts of individual schools are not
  evaluated;
- the concept of effectiveness is vague.

However, the concept of effectiveness with regard to
educational institutions and the evaluation of their conditions
(context) remains relevant to federal, regional, and local education
authorities. The state-run program for education development
spanning from 2013 to 2020, includes the subprogram “The
Development of Quality Assessment and Transparency of the
Education System,” which serves for the introduction of a national
system of quality assessment and monitoring. The Ministry of
Education and Science and the Federal Service For Supervision of
Education and Science continue to work on the creation of a
national system for assessment of the quality of education.⁵

In addition, a number of federal entities have expressed
commitment to go beyond the “road map” and to build an
appropriate system for assessing the effectiveness of schools. The
contextual approach to assessing educational institutions
described in the present article may be useful for this purpose.
1. Accounting for Contextual Data in Education

Noting the lack of contextual data in the current system of education quality management and assessment of effectiveness, we are not saying that contextual data are completely ignored. However, existing studies are still not sufficiently systematic, are often bound to several regions, and are methodologically so disparate that it is impossible to make meaningful comparisons (Konstantinovskii, Vakhshtain, and Kurakin 2013; Sobkin and Pisarskii 1998; Iastrebov et al. 2013).

What do we mean when we speak of contextual data in relation to the field of education? What is context? In the broadest sense, context is any environment or system where a particular process or phenomenon acquires its distinct content. When one claims something has been taken out of context, they state that some specific information cannot be adequately considered without the additional information that grants it meaning.

Regarding the education system, context can be defined as the circumstances in which the educational process takes place, circumstances that are external to the process itself (i.e., inessential, but influential). These external factors cannot be ignored when evaluating the educational process, which are however not always evident to and cannot be controlled by those participating in the educational process.

In our previous articles, we have discussed the theoretical framework for using contextual data to evaluate educational institutions (Iastrebov 2012; Iastrebov et al. 2013; Pinskaia, Kosaretskii, and Froumin 2011). Most of the present-day research dealing with the organization of education, as it relates to social and economic inequalities, often make reference to major sociologists, such as D. Coleman or P. Bourdieu. This research has shown that social and economic factors (be these familial, communal, regional, or national) define the context out of which it is impossible to understand the activity of either a specific educational institution or an entire education system, and without which adequate assessment of effectiveness is impossible.
Numerous studies have been conducted to determine how socioeconomic benefits evolve into education benefits. For instance, wealthy families can afford the services of private tutors and other extracurricular learning. Families with high levels of education have certain culture, are more interested in establishing a cooperative relationship with the school, and take a more active role in its life. However, despite the abundance of empirical studies devoted to inequality in Russian education (Iastrebov 2010; Konstantinovskii et al. 2011; Prakhov and Iudkevich 2012; Roshchina 2012) and the fact that the mechanisms of this inequality are understood reasonably well, in practice this knowledge is rarely demanded or used, and remarkably not incorporated into official statistics.

In a number of other countries such practice is well established. For example, the British system of evaluating school performance includes data on sex, age, ethnicity, and socioeconomic composition of students, alongside with their potential for mobility within educational institutions, which can distort the evaluation. The U.S. has no federal system of accounting for contextual data; instead, these systems (which are quite similar to one another) exist at the state level, in states like Florida, South Carolina, Wisconsin, and Tennessee (OECD 2008, p. 76). Readers of Problems of Modern Education are likely familiar with the cases of Australia (Valdman [Waldman] 2013a) and Chile (Valdman 2013b). In Australia, a comprehensive account of contextual information is made via a specially developed index, called the Index of Community Socio-Economic Advantage, which is calculated individually for every school. The evaluation is the sum total of different socioeconomic indicators, the value of which is determined annually (within the general formula) based on specific analysis, and reflects the degree of influence of each indicator as it relates to differences in student performance. Further comparison of individual educational institutions is based on this index, which is used to identify “statistical neighbors,” that is, groups of schools with similar index values (i.e., similar socioeconomic and education conditions). In Chile, all schools are categorized into five groups by means of a cluster analysis.
based on three variables: education of students’ parents, family income, and an index measuring school’s social vulnerability, then a comparison of individual educational institutions is performed within these five groups.

The indicators used in most countries are quite similar and are amenable to statistical evaluation, since the relevant information is usually collected by the educational institutions during the process of enrolment. Differences in accounting systems may be caused by the value of particular indicators attributed within specific national contexts. For instance, student ethnicity and citizenship may have little relevance in countries with low immigration. In addition, there are possible financial, legal, and ethical limitations regarding the gathering of certain contextual indicators. The general trend is toward gradual breaking of these limitations, which is a prerequisite for effective administration of education quality.

Many Russian researchers have written about the need to use contextual indicators when comparing the effectiveness of schools and education systems (Agranovich 2008; Bochenkov and Waldman 2013; Bolotov and Waldman 2013). For example, comparing regional education systems, the authors of Using Performance Indicators to Manage the Quality of Regional Education collected book noted that the following contextual parameters determine the socioeconomic idiosyncrasy of the Russian Federation: per capita gross regional product, percentage of the rural population, migration balance, unemployment rate, and development of the sociocultural infrastructure. (Agranovich et al. 2008, p. 21). In Russia, one of the first attempts to classify regional education was conducted on similar principles (Sobkin and Pisarskii 1998).

Examples of the usage of contextual information for direct classification of educational institutions are still very rare. One of such studies was conducted under the supervision of D. Konstantinovskii, in which cluster analysis was used to build a real school typology, which let create a classification of multiple indicators: besides “results” indicators the analysis also incorporated indicators relating to “entrance” and “process.”
The merit of the study is based on the fact that the selection of specific indicators included both theoretical concepts and statistical analysis, with a purpose to isolate the contextual characteristics most related to the results (Konstantinovskii, Vakhshtain, and Kurakin 2013). In 2008, an approach to constructing a typology of educational institutions, using cluster analysis and conceptual data was proposed by Agranovich et al.

Clustering is certainly a step in the right direction. In fact, it does not matter whether it is carried out statistically (i.e., a cluster analysis), or arbitrarily (when the criteria are defined a priori). What is important is that the “output” produces groups of statistical entities that have similar sets of features. However, in our view, this approach has one significant limitation associated with discrete clusters and types. Clustering, by definition, reduces a variety of objects to a limited number of groups, which results in an inevitable loss of some information. First and foremost, it concerns characteristics expressed by means of continuous variables, such as USE scores, the rate of enrollment, and percentage of students from socially deprived families. Within a single category, the differences between the constituents are ignored; as a result, more differentiated evaluation and comparison become difficult. This particularly concerns borderline constituents, whose characteristics bear the extreme values within their group.

In this article, we suggest a technique that bypasses these limitations. It is an attempt to adapt existing methodological developments to the Russian reality.

2. Conceptual Approaches to the Evaluation of School Effectiveness

As a result of numerous studies focusing on the factors affecting the learning process, and the attention allotted to an improvement of the effectiveness of the education system all over the world, a conceptual foundation exists for the evaluation and comparison of educational institutions.
Many conceptual models have been developed to describe the process of learning and the potential factors affecting its development (Barr and Dreeben 1983; Rumberger and Thomas 2000; Shavelson et al. 1987; Willms 1992). All of them approach the process as a composite phenomenon that includes an interdependence of multiple causes.

It is necessary to address the multilevel structure of the educational process, because learning is a result of layering of factors. For instance, at the individual level, student’s success depends on his or her own efforts and practice. At the class level, success depends on the number of students and teacher’s performance. At the school level, the availability of financial, human, and other resources is decisive, which also determine the quantity and quality of the educational opportunities provided to the students. Thus, studying the criteria of effective education is inadequate without sufficient representation of many contributing factors and levels of their manifestation, and it is even more problematic when different ratings are constructed without taking into account the circumstances of academic achievement.

For foreign case studies of school effectiveness (Hanushek 1986; Levin 1994), the so-called economic model of the school is the most common. It considers the educational institution on the analogy of any other organization performing within the scope of certain limits. According to this model, the learning process consists of three primary components.

First, there are the resources that include not only teachers and material/technical capabilities, but most importantly the student body, which is characterized by its share of talented individuals, their level of initial education, and other variables external to the school, which influence the mastering of the curriculum. This includes the parents’ ability to pay for additional education and tutors. Thus, a school’s resources are categorized either as given or external (Hanushek 1989).

In the broadest sense, the second component consists of the education process itself. The nature of this process, in fact, determines how effectively available resources are translated
into learning results. Its quality may depend on the efficiency of school’s administration, the idiosyncrasies of a school’s internal environment, the use of certain pedagogical practices, or the relevance of educational programs—key to the identification of effective models of the education process (Shavelson et al. 1987).

The third component consists of the results—the degree of acquisition of the school curriculum, grades, and other academic achievements. The set of variables that make up education results depends on the range of target functions of education or the function of a specific educational institution (e.g. the function of socialization, the acquisition of social proficiency, etc.). In order to identify truly effective models of the educational process, it is important to go beyond the results, and consider initial conditions in which the results are produced.

Special instruments have been developed for the assessment of school effectiveness—a special class of statistical models to directly or indirectly quantify the parameters that characterize the contribution of different factors in the formation of academic achievement. The models use a multiple regression analysis and statistically describe the connection between a dependent variable and an explanatory indicator. These types of models are used in most natural science and some social science fields (especially economics and sociology).

The assessment models described below can be divided into three main categories based on the criterion of available indicators used to fix education results:

(1) an assessment model of current academic achievement;
(2) an assessment model of academic progress (value added);
(3) an assessment model of academic achievement that uses discrete indicators (Rumberger and Palardy 2004, p. 240).

In each case, the choice of the model is determined by the nature of the available data.

The most common type of model for assessing school effectiveness is used for assessing current academic achievement.
It is used in cases when the data about academic achievements are restricted to specific time and there is no way to assess its dynamics (e.g., by retesting or collecting data from an alternative scenario). For example, such a model can be used to study the results of the USE, the State Final Exam (SFE), or any other specific student test as a function of student’s classroom activity, intensity of home study, quality of teachers’ work, school curriculum, and other factors. Regarding schools, and not individual students, these models can be used to represent the connection between the test results of a particular group of students and parameters of the group’s social and economic composition, as well as teacher and staff support (a model of contextualizing).

*Value-added models of academic progress* are less common; however, they are among the most advanced (OECD 2008). These models are rarely used due to the complexity and cost of obtaining the necessary data for their construction: assessing academic progress requires systematic testing of students’ knowledge during the process of mastering the curriculum. For financial reasons, not all countries can afford to produce the content necessary for such assessment systems. Today, they are prevalent in developed countries, such as Great Britain and some U.S. states. The undoubted advantage of these models is their ability to fix the initial level of student’s knowledge, which can be used to produce a close estimate of the growth gained as a result of attending school.

Finally, the *model of academic achievement using discrete indicators* is used in those rare cases when the resulting indicator is expressed using a discrete value. An indicator might be a student’s removal from school, voluntary transfer to another school, or winning an Olympiad competition. Another possible example of discrete indicators is the fixing of academic results with the use of a limited grading scale, such as the 5-point system of assessment widespread in Russia. Regarding educational institutions themselves, a discrete indicator may be their position in a formal system of classification that distinguishes between institutions according to their degrees of success.
these models are used in cases when academic results cannot be measured with continuous indicators, such as the USE scores and SFE.

Regardless of the model used to evaluate academic achievement, a critical condition is the identification and accounting of factors at the following levels: individual (individual abilities and family characteristics), group (class composition and teacher characteristics), school (the overall situation in terms of staff, finance, and curriculum), and finally territorial (the district, city, and even region where the school is located). The advantage of this approach is that it estimates the contribution of each factor (or groups of factors) separately, treating them sequentially—from the most individual to the most aggregated. The analysis makes the level where the factors significantly affecting the outcome are concentrated particularly clear. Such information is especially valuable for decision makers responsible for implementing education policy and allocating existing resources. The majority of the research and analysis of education effectiveness, conducted outside Russia, uses this multilevel approach (Aitkin and Longford 1986; OECD 2008, p. 15; Willms and Raudenbush 1989).

On the other hand, even simple models that operate on generalized information (the average characteristics of academic results, the social composition of the students, the human and material resources of the school, etc.) demonstrate the insufficiency of ratings based on exclusively “exit” indicators (Burstein 1980; Dyer, Linn, and Patton 1969; McCall, Kingsbury, and Olson 2004). The basic idea of this analysis is intuitive: schools are not ranked based on absolute volume or level of academic results, but according to how their results could be compared with the statistical average of other schools with similar human and resource parameters. The difference between bare results and statistical averages is often scientifically interpreted as “school effects” or “school contributions;” although, strictly speaking, the advent of more accurate models that take into account academic progress
(i.e. the value added models), has made such a definition incomplete (OECD 2008, 15).

3. Using contextual data to compare the effectiveness of Russian schools

The current system of statistical recording in Russian institutions of secondary education not only fails to involve individual indicators of academic progress, but also makes it impossible to analyze individual academic results in relation to socio-demographic information (despite the fact that for the purposes of the analysis, this information can be used anonymously).

Perhaps the electronic monitoring statistics gathered within the framework of Our New School project are the most complete and transparent. However, this data is collected at the level of an educational institution, (i.e., information on individual students is not available), and more importantly, despite its heterogeneity the published range of indicators does not represent the social composition of students. In spite of the potential of this information base, it is impossible to use it in order to perform a full analysis of school effectiveness in accordance with the above stated principles and approaches. The lack of necessary contextual information, namely social characteristics of students and their families is a fundamental problem that must be addressed before any assessment model of school effectiveness can be adapted in the Russian context.

To demonstrate the possibility of using contextual data to compare the effectiveness of Russian schools, we have incorporated the material of our previous work based on the information collected in two Russian regions (2011–12). In that study, we revealed that academic performance varies consistently between schools depending on student composition, teachers, and material resources (Iastrebov et al. 2013). The data for that study were gathered from the “social passports” of educational institutions, which are not mandatory for schools and have yet to be produced for a significant number of federal regions. In our
case, the data were collected by request after a special appeal to regional education authorities.

These social passports are gathered by the administration of educational institutions or social pedagogues (a category of school staff that has been reduced, which makes this practice increasingly rare) and represent information that was voluntarily provided to the schools by parents. Along with the information gathered from the social passport, we also requested additional data, such as academic results (e.g., USE scores in Russian and math), number of students, type of facility, and percentage of teachers with a certain level of qualification. Key indicators acquired from the expanded social passports are given in Table 1.

The suggested use of contextual data outlined below is based on substantial simplification, because its basic unit of analysis is not individual students, but the school as a whole—the aggregate of student characteristics. As a result of this simplification, some of the effects occurring at a more specific level of analysis (e.g., family influence on the child’s academic achievements, without which it is impossible to adequately assess the contribution provided by the school), are inevitably obscured in the analysis, and become statistically less distinct when transferred to the aggregate level. However, despite a priori lack of accuracy in comparison with more complex models built on individual data, this approach could be adapted for the analysis of school effectiveness, as it has been used in situations where an alternative approach is not available due to similar restrictions (OECD 2008, p. 15).

3.1. Analysis using regression model residuals

Using the above information according to specific school categories (e.g., regional), we can determine the empirical relationship between the indicators of academic results (or any other indicators of a school’s functional objective) and contextual characteristics. The most common procedure for identification of this relationship is a multiple regression analysis, which in a particular case is represented by a search for the optimal trend line for points scattered on the coordinate plane of a graphic (e.g.,
a graphic projecting the dependence of the mean score of the USE from the percentage of teachers of the highest category). Multiple regression analysis allows us to do the same thing, but for an unlimited number of arguments—that is, for three or more measurements, when, for example, the scatter of results needs to be described depending not only on the percentage of teachers of the highest category, but also on the characteristics such as the ratio of the number of teachers and students or the percentage of students from wealthy families. The point of this analysis is to establish function parameters, which facilitates the most accurate

<table>
<thead>
<tr>
<th>Characteristics of the student body</th>
<th>Characteristics of the educational institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of students from families with many children</td>
<td>Type of educational institution (regular secondary school, lyceum, gymnasium, high school with special subject emphasis)</td>
</tr>
<tr>
<td>% of students from single-parent families</td>
<td>Number of students</td>
</tr>
<tr>
<td>% of students who are under the care of legal guardian</td>
<td>Number of students per teacher</td>
</tr>
<tr>
<td>% of students from families where both parents are unemployed</td>
<td>Director's special education (a degree in management)</td>
</tr>
<tr>
<td>% of students from families where one parent is unemployed</td>
<td>Building condition (presence of disrepair or requiring extensive renovation)</td>
</tr>
<tr>
<td>% of students from families where both parents have higher education</td>
<td>% of teachers of the first category</td>
</tr>
<tr>
<td>% of students from families where at least one parent has higher education</td>
<td>% of teachers of the highest category</td>
</tr>
<tr>
<td>% of students from families living in apartments with limited amenities</td>
<td>% of teachers with higher pedagogical education</td>
</tr>
<tr>
<td>% of students from families living in their own homes</td>
<td>% of teachers working as retirees</td>
</tr>
<tr>
<td>% of students for whom Russian is not the primary language spoken in the family</td>
<td>Urban/rural status of the school</td>
</tr>
<tr>
<td>% of students who live in foster care</td>
<td>Average USE score in math</td>
</tr>
<tr>
<td>% of students who are intraregistered by their school as at risk</td>
<td>Average USE score in Russian</td>
</tr>
<tr>
<td>% of students who are registered with the Commission on Juvenile Affairs and Rights Protection</td>
<td>% of students from families where at least one parent is disabled</td>
</tr>
</tbody>
</table>
description of the spread of the dependent indicator by using several explanatory arguments.

In a simplified vector form, the model can be expressed as the following:

\[
Y_i = \beta 0 + Bn \times (\text{student body characteristics})i + Bm \times (\text{school characteristics})i + e_i
\]

where \(Y_i\) is the dependent indicator for school \(i\). These can be any indicators of a school’s functional objective. Here, we will use USE averages to demonstrate the method.\(^{12}\) Parameter \(\beta 0\) is fixed, that is, independent of function arguments—the characteristics of schools and students based on USE scores, to which all the following effects are added; \(Bn\) is a vector composed of \(n\) parameters reflecting the degree of connection between relevant student characteristics and average USE scores (where \(n\) corresponds to the number student characteristics included in the model); \(Bm\) is a similar vector of \(m\) parameters, but for school characteristics themselves (where \(m\) corresponds to the number of these characteristics); \(e_i\) is the residual or “noise” that characterizes the dispersion of USE indicators between schools and which cannot be explained with the help of other factors included in the model and is considered a random effect in this case.

The model summarized above assumes that all its explanatory factors (vectors of characteristics) are associated with the dependent variable \(Y_i\) (academic results) linearly, which is not an unrealistic premise and is easily checked with the help of graphical analysis by constructing scatterplots for pairs of variables, with one being the dependent variable, and the other explanatory. In any case, multiple linear regression has the advantage of modeling nonlinear relationships by using various transformations of its variables (e.g., logarithm, exhibition, and exponentiation).

All of the above parameters (\(\beta 0\), as well as elements \(Bm\) and \(Bn\)) are estimated by using least squares, which makes it possible to choose the values of these parameters that allow accurate description of the differences between schools in terms of \(Y_i\).
using explanatory factors (i.e., school characteristics and student characteristics). The value of each parameter is interpreted as a normal regression coefficient, which shows how the dependent variable changes on average (the learning outcomes) for the corresponding change in the explanatory variable to the one, while all other variables in the model do not change (i.e., they are statistically controlled). In this way, the sign of the coefficient and its value reflect the nature of the relationship (positive or negative, strong or weak). However, the regression models do not identify causal relationships. They do not give grounds for asserting that the explanatory variables affect the dependent variables—they only allow us to establish the existence of a relationship.

Table 2 shows the values of the coefficients (parameters), which were obtained as a result of multiple regression analysis by applying the above model and using real data from schools in three Russian regions during 2011–12. These results do not reflect the situation in Russia in general, because the sample is limited to three study regions and a small time interval. Therefore, no intervention in existing educational policies should be made on the basis of the presented assessments—again the present study is only a demonstration of the method.

Table 2 shows only those indicators, which according to the present analysis, proved to be stable and statistically related to the dependent variable (average USE scores in Russian and math), and therefore may be considered as grounds for contextualization, that is, a better-informed comparison of educational institutions—comparisons that take into account the nature of schools’ resources and the complexity of the student body. In fact, the process of obtaining these estimates comprises several iterations during which the models are run with various sets of explanatory variables. The purpose of these iterations is to choose the optimal model for every dependent indicator (USE scores), which allows to predict the differences between schools most accurately with the help of a limited list of explanatory variables (and in a way that the variables remain orthogonal to one another). Table 2 only shows the parameters of the final model.
The interpretation of the regression coefficients depends on the scale at which the explanatory and dependent variables are measured (e.g., points, percentages, units, tenths of a unit, etc.). For example, consider the interpretation of the average USE scores in math for “the percentage of students from families where both parents have a higher education.” The coefficient for this variable is 0.06, and is statistically significant at the 99 percent level. This means that each additional increase in the

Table 2

Parameters of Regression Models Describing the Relationship Between Average USE Scores of Schools with School Characteristics and Student Social Composition

<table>
<thead>
<tr>
<th>Model parameters</th>
<th>Coefficient for USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed (not related to explanatory variables)</td>
<td></td>
</tr>
<tr>
<td>level of the USE average results (constant)</td>
<td>42.74** (1.25)</td>
</tr>
<tr>
<td></td>
<td>59.61** (1.16)</td>
</tr>
<tr>
<td>Student characteristics</td>
<td></td>
</tr>
<tr>
<td>% of students from single-parent families</td>
<td>–0.10** (0.02)</td>
</tr>
<tr>
<td></td>
<td>0.07** (0.02)</td>
</tr>
<tr>
<td>% of students from families where both parents have a</td>
<td></td>
</tr>
<tr>
<td>higher education</td>
<td>0.06** (0.01)</td>
</tr>
<tr>
<td></td>
<td>0.06** (0.01)</td>
</tr>
<tr>
<td>% of students for whom Russian is not the primary</td>
<td></td>
</tr>
<tr>
<td>language spoken in the family</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>(0.09** (0.04)</td>
</tr>
<tr>
<td>% of students who are intraregistered by their school</td>
<td></td>
</tr>
<tr>
<td>as at risk</td>
<td>–0.25** (0.09)</td>
</tr>
<tr>
<td></td>
<td>–0.25** (0.09)</td>
</tr>
<tr>
<td>School characteristics</td>
<td></td>
</tr>
<tr>
<td>Urban school</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>2.06** (0.54)</td>
</tr>
<tr>
<td>Lyceum or gymnasium</td>
<td>2.63** (0.62)</td>
</tr>
<tr>
<td></td>
<td>3.07** (0.57)</td>
</tr>
<tr>
<td>Specialized school</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>1.40* (0.67)</td>
</tr>
<tr>
<td>Number of students</td>
<td>0.01** (0.00)</td>
</tr>
<tr>
<td></td>
<td>0.01** (0.0)</td>
</tr>
<tr>
<td>Number of students per teacher</td>
<td>–0.24** (0.06)</td>
</tr>
<tr>
<td></td>
<td>0.27** (0.06)</td>
</tr>
<tr>
<td>% of teachers of the highest category</td>
<td>0.06** (0.02)</td>
</tr>
<tr>
<td></td>
<td>0.05** (0.01)</td>
</tr>
<tr>
<td>% of teachers of the first category</td>
<td>0.06** (0.02)</td>
</tr>
<tr>
<td></td>
<td>0.05** (0.01)</td>
</tr>
<tr>
<td>Model accuracy (explanatory power)</td>
<td>0.27</td>
</tr>
<tr>
<td>Coefficient of determination (R²)</td>
<td>0.35</td>
</tr>
</tbody>
</table>

Note: The parentheticals show the standard errors of the regression coefficients; * Significant at the 5% level; ** Significant at the 1% level.
percentage of students from families where both parents have a higher education, is by 1 percent tied to the increase of the result average of the math section of USE by 0.06 points (by 10 percent or 0.6 point). When we interpret the coefficient in this way, we are assuming that all other variables remain unchanged—as if we were considering two absolutely identical schools, distinguished only by the number of students both of whose parents have higher education. Similarly, as can be seen in Table 2, in schools where the percentage of students from single-parent families is 10 percent higher, the average USE math results are 1 point lower (the negative coefficient 0.10 is multiplied by 10), again with the provision that all other variables remain unchanged. Finally, the accuracy or explanatory power of the linear regression models is measured by the coefficient of determination, which corresponds to the percentage of the variance of “dependent” indicators explained by the model, which is one of the key criteria for selecting the optimal regression model (which in our case are the USE scores in two subjects).

In general, the analysis allows us to conclude that academic performance, as measured by USE scores in Russian and math, is consistently different for schools with varying social compositions of the student body—academic achievement is higher in more prosperous social environments. The more sensitive characteristics in our sample of schools are parental education, percentage of students from single-parent families, and the presence of students at risk (i.e., students who are intraregistered by their school as at risk, who are registered with the Commission on Juvenile Affairs and Rights Protection, etc.). Regardless of their level of qualification, it is more “convenient” for teachers to work with students whose parents show interest in their children’s academic performance and actively invest available resources into various forms of extracurricular education. Behavioral problems, cultural barriers, and lack of attention given to students by their parents creates difficulties for teachers, and should be considered when evaluating the results of the teachers’ activities and school performance.

Along with the social composition of the students, average academic performance is also connected with a number of
characteristics that produce qualitative differences between schools. Among the most significant of these are types of educational institutions (e.g., lyceums, gymnasiums, or schools with special subject emphasis), size of student body, and staff parameters (e.g., percentage of teachers of the highest category). Of course, these factors often overlap: lyceums and gymnasiums are usually major educational institutions with a large percentage of highly qualified teachers. They belong to a privileged type of schools and they should justifiably be held to higher academic standards. However, for each of these three factors an independent connection can be observed in relation to performance indicators. This means, for example, that by comparing the effectiveness of schools of the same type and with comparable staff it is impossible to ignore differences in facilities, which may conceal funding discrepancies.  

Models for two dependent variables—USE in math and USE in Russian—are somewhat different. First, the coefficients themselves have different values (but not the sign of relation, i.e., not its character). Second, the model for USE scores in Russian looks slightly better, because it includes factors such as the status of urban schools and the percentage of students for whom Russian is not the primary language spoken in the family. Without going into a detailed explanation of the possible reasons for these differences (they were in part explained by Iastrebov et al. 2013), we note only that the regression analysis is a relatively flexible tool for establishing differences in the sensitivity of result indicators. This attribute contextualizes the contextualization tool itself depending on conditions, nature of the samples, and the variable sets in relation to which it is applied.

A good illustration of grade inconsistency based on a direct comparison of USE scores without taking into account social context and school conditions is shown in Figure 1. The horizontal axis represents the actual values of average USE scores for two subjects. The vertical axis represents USE scores, approximated by the model parameters provided in Table 2. They represent contextualized grades (i.e. grades of expected USE values, obtained by taking into account the social context and
school conditions). The contextualized grades themselves are calculated for each school by trivial formulas, where the expected USE scores are the product of summing the corresponding effects (taken from the results of the analysis in Table 2):

Of course, the expected values of the USE scores produced by these formulae should be interpreted with caution, taking into account the existence of a statistical error in calculating the coefficients (see: the values of the standard error in Table 2). Their mechanical application gives only a point of reference for comparison with actual results. In this case, the resulting difference (the residual) shows how the actual performance indicators are above or below the level expected for a specific school, given its resources and context.

Figure 1 shows that the actual and contextualized assessment in most cases are different: their perfect convergence in the graph corresponds to the diagonal, where the value of the horizontal axis is equal to the vertical. Points lying above the diagonal correspond to schools whose contextualized results turned out to be higher than the actual results—potentially these are the schools in need of development—and the points lying below the diagonal represent schools that demonstrated higher USE scores than those which are “acceptable” given the complexity of their

Figure 1. Divergence of Average USE Indicators by Schools and Their Contextualized Assessment
social context—these are the schools that have successfully overcome their specific limitations and are potentially effective.

The nature of these deviations, as well as the degree of the relative effectiveness of the educational institutions can also be fixed with the help of an analysis of the residuals of the regression models, which represent the difference between the actual value of the average USE scores for a specific school and the value produced on the basis of modeling the relevant factors.

Figure 2 shows the actual distribution of the regression residuals. These distributions are close to normal with a mean close to zero (one of the key requirements for quality specification of a regression model estimated on the method of least squares). The values of the residuals show the extent to which the results of particular schools diverge—positive or negative (depending on the sign)—from those predicted by the model based on factors considered therein. Accordingly, they can be interpreted as absolute excess or shortfall in terms of the indicators of effectiveness (expressed in the corresponding units, which in this case are the mean USE scores) with respect to the expected (statistically average) of the results for schools with the same set of characteristics and resource constraints. Obviously, with this approach a higher bar is set for schools operating in more favorable contexts.

Figure 2. Distribution of “Residuals” of the Regression Models for the USE scores in Russian and Math
Strictly speaking these residuals in the regression model are considered random; however, they can be recognized as random only if the model includes a full range of factors that describe the distribution of the indicator. In our case, it is clear that this is not the case: the data (on the content of educational programs, the individual abilities of students, etc.) remains outside the scope of the analysis. Therefore, the analysis of residuals may be seen as the subject of an independent research project. Based on the analysis of these deviations, schools can be divided into two conventional groups: the *resilient* (capable of overcoming their limitations and producing results better than those predicted by the model) and *incapable* (those that show significantly lower results than those predicted by the model). Figure 2 shows the distribution of these groups corresponding to the positive (right of the zero) and negative (left of the zero) remaining value.

The deviation of actual results from the expected performance, taking into account the conditions and contexts, can be considered as a marker of the potential effectiveness or ineffectiveness of educational institutions. The critical value of these deviations can be established randomly, but given the inevitable calculation error of the expected performance with the help of the regression model for each educational institution, it is also advisable to calculate the confidence interval of such values. To determine the corridor of acceptable values, the formula of upper and lower limit can be calculated, which does not use the regression coefficients themselves, but the corresponding upper and lower limits of the confidence intervals of the coefficients. When the actual values fall inside the delineated bounds, it demonstrates that the school as a whole shows results that are typical (i.e. not statistically distinguishable in relation to the average) for schools with similar characteristics. If it turns out that the actual results of the USE are lower (or higher) than the designated limit, it is highly probably that the results of the school are significantly lower (or higher) than expected, given its context and other characteristics.
3.2. Analysis with an index of the school’s social prosperity

There is another way to use regression analysis data to account for social context when assessing academic results of schools—that is, by using the conditional social prosperity index of a school. It is simpler, but also has certain disadvantages, which are discussed below.

Among the student characteristics linked to USE scores the following indicators are presented (see Table 2):

(1) percentage of students from single-parent families (−);
(2) percentage of students from families where both parents have higher education (+);
(3) percentage of students at risk (−).

In this case, we do not present the percentage of students for whom Russian is not the primary language used in the family, because it was relevant in only one of the models. For the purposes of the demonstration, we limited ourselves to the three above indicators in order to avoid generating excess essence.

Since these characteristics are measured in the same units (percentage), the received coefficient can be used to determine the specific density of these characteristics when compiling an aggregate index of a school’s social prosperity. Table 3 gives the values of the coefficients produced by regression analysis once again. We’d like to recall, that with certain formality they can be understood as characterizing the contribution of corresponding indicator in the shaping of school’s academic results. In the light of this information, it is possible to estimate the approximate densities of the contextual indicators within the school social prosperity index (SSPI), which could be used to describe the social composition of students and subsequently differentiate between educational institutions and produce for more accurate comparisons.

It is not difficult to compute specific densities for the component index, for example, by dividing the modal values of individual coefficients by their sum total. Table 3 shows the recommended values of these densities, obtained by averaging the indices for
two models (for the USE scores in Russian and math). Thus, one possible construction of such an index can be as follows:

\[
\text{SSPI} = 85 + 15 \times \frac{\text{percentage of students from families}}{20} + 0.06 + 0.06 + 0.25 + 0.25 - 65 \times \frac{\text{percentage of at-risk students}}{65} + 0.41 + 0.38
\]

where the first value (85) only allows the index to bring the scale ranges from 0 to 100. Conceivably, in the most favorable position for a school (when all the positive characteristics of social composition equal 1 and the negative equal 0) the index equals 100 and in the least favorable position the index equals 0. Another method would be to use the “convolution” of an integral indicator (for example, the widely used Z-standardization). It is important for the scale to register different densities of the composite indicators, in proportion to their potential contribution to the spread of the indicators of the result. SSPI is calculated for each

<table>
<thead>
<tr>
<th>% of students from single parent families</th>
<th>Average USE scores in math</th>
<th>Average USE scores in Russian</th>
<th>Specific density for general index building</th>
</tr>
</thead>
<tbody>
<tr>
<td>~20%</td>
<td>(0.10)</td>
<td>(0.07)</td>
<td></td>
</tr>
<tr>
<td>% of students from families where both parents have a higher education</td>
<td>+0.06</td>
<td>+0.06</td>
<td>~15%</td>
</tr>
<tr>
<td>% of at-risk students</td>
<td>(0.25)</td>
<td>(0.25)</td>
<td>~65%</td>
</tr>
<tr>
<td>Sum of the coefficient modal value</td>
<td>0.41</td>
<td>0.38</td>
<td>100%</td>
</tr>
</tbody>
</table>
educational organization based on the original information contained in the social passport.

The fact that the result indicators are more sensitive to SSPI than to its individual factors is easily demonstrated by a correlation analysis using data from the same three regions for which the parameters of the regression model were calculated (Table 4).

Now, let us consider how SSPI can be used to compare the performance of educational institutions in accordance with their social context.

In many ways our method of accounting for contextual information is similar to the one used by the Australian National Assessment Program, NAPLAN. First a group of “statistical neighbors” (i.e., educational institutions with similar operating conditions) is identified, then the institutions within the group are compared. For this purpose, it is useful to first determine the qualitative differences other than those measured on SSPI. For instance, suppose that these differences related to the type of institution (i.e., regular secondary school, lyceum, gymnasium, or subject specific school) and its urban or rural status. As an example, we suggest considering a group of regular urban secondary schools.

<table>
<thead>
<tr>
<th>Social context indicators</th>
<th>Average USE scores</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>In Russian</td>
</tr>
<tr>
<td>SSPI</td>
<td>0.50</td>
</tr>
<tr>
<td>% of students from single parent families</td>
<td>−0.21</td>
</tr>
<tr>
<td>% of students from families where both parents have a higher education</td>
<td>0.44</td>
</tr>
<tr>
<td>% of at risk students</td>
<td>−0.38</td>
</tr>
<tr>
<td>% of students for whom Russian is not a native language</td>
<td>−0.11</td>
</tr>
</tbody>
</table>

*Note: All the coefficients are significant at the 1% level.*
Schools in this group can also vary considerably according to their social composition; therefore, it is necessary to differentiate using the index constructed above. To do so, schools can be divided into 5 quintiles with SSPI values from lowest to highest, where the lowest quintile represents the schools with least prosperous student body and the top represents the most prosperous. Table 5 provides some group parameters for the aggregate of urban schools in three regions: the interval of the actual SSPI values and the average USE scores in two subjects. (The list of characteristics can be expanded to include other indicators of educational institution performance.)

As can be seen from Table 5, the average performance is consistently and predictably different for urban school groups differentiated by the level of social prosperity. However, as it will be shown below, after noting important conditions of the educational institutions, even within these relatively homogeneous groups there are differences that should be considered as markers of potential effectiveness or ineffectiveness.

Figure 3 shows the distribution of urban schools from the 5th, socially most prosperous, quintile in two dimensional space representing average USE scores in Russian and math. Each point on the graph corresponds to one school. As can be seen, a significant portion of the educational institutions is concentrated

### Table 5

**Grouping of Urban Schools According to SSPI**

<table>
<thead>
<tr>
<th>Level of SSPI (groups in quintiles)</th>
<th>Interval of actual SSPI value</th>
<th>Average USE scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low (1st quintile)</td>
<td>[0; 79.5]</td>
<td>58.1 40.7</td>
</tr>
<tr>
<td>Below average (2nd quintile)</td>
<td>(79.5; 81.6]</td>
<td>59.1 42.9</td>
</tr>
<tr>
<td>Average (3rd quintile)</td>
<td>(81.6; 83.9]</td>
<td>62.6 44.4</td>
</tr>
<tr>
<td>Above average (4th quintile)</td>
<td>(83.9; 86.4]</td>
<td>63.0 45.6</td>
</tr>
<tr>
<td>High (5th quintile)</td>
<td>(86.4; 100]</td>
<td>64.2 46.7</td>
</tr>
</tbody>
</table>
around the average of academic results, which can be considered typical for the schools with the relevant qualitative characteristics (this area is marked by an ellipse). Going outside this area indicates that a school has performed higher or lower than the rest of its group. These are schools that should be an object of much attention for education administrators, and in the case of the lower schools, intervention.

For example, special attention should be paid to school no. 2 located in the upper right quadrant of the figure. This school performed much higher on both the Russian and Math portion of the USE, despite having seemingly the same conditions and context as the other schools in its group. There are several possible reasons for the success of school no. 2: from a well-structured learning process, uniqueness of educational programs, or the highly effective teachers to intentionally (or unintentionally) altering of the results. In any case, these figures serve as a pretext for an investigation of the situation at that school to take appropriate
administrative decisions (e.g. study the school and extend its program to other educational institutions).

In the lower left quadrant of Figure 3 are schools no. 4 - 6, whose poor performance cannot be explained by simply appealing to school environment and social context, since the group in question is already “aligned.” The educational policies implemented to these schools should primarily focus on studying why these schools, in spite of their relatively auspicious conditions, performed worse than their counterparts.

The proposed method can also detect intermediate cases such as schools 1, 3, and 7, which show better or worse performance where relative advancement or shortfall occurs only for a specific group of output indicators.

The two USE indicators and the illustration in Figure 3 are only a demonstration of the method, which can be used to treat contextual information when comparing the performance of educational institutions. The range of these indicators can and should be expanded to cover the most comprehensive list of target indicators, in order to track how successful schools exercise their educational and social functions. This analysis, as well as the analysis by regression residuals, should likewise be expanded to include dynamic comparison, which takes into account the dynamics of indicators over a relatively long period of time, without which it is impossible to understand how stable (and not arbitrary) the differences between schools really are. When making such complex comparisons, it is important to take into account the limitations on the implementation of the relevant measures that are imposed by already existing conditions and social contexts of the schools.

The general principle of the analysis presented in this article reproduces the logic of the analysis using regression residuals. For schools with identical characteristics, the average result indicators are calculated first, which are then compared with the real performance indicators of specific educational institutions. Admittedly, the division of schools into groups of statistical neighbors is similar to the cluster approach, which has already been used (Agranovich et al. 2008; Konstantinovskii, Vakhshaitin,
and Kurakin 2013), but the cluster analysis has its limitations. In particular, it ignores the problem of SSPI boundary values (e.g. the interval boundaries shown in Table 5) and other continuous variables used to form groups of schools, because deviations based on results (including those in Figure 3) may be the product of some internal difference. That is why we believe the method outlined above is preferable.

**Conclusion**

In Russia, it is still not customary to account for contextual data when assessing the effectiveness of educational organizations. Many studies (including this article) have shown that it is wrong to neglect such data, especially when it comes to developing an effective and balanced educational policy capable of responding to specific emerging issues.

The tools and methods of using contextual information for educational policy are quite diverse and are not limited to those discussed in this article. In Russia, however, certain critical prerequisites for a full implementation of these tools are missing. One of these prerequisites is the systematic collection of data on the social composition of students, which today is an entirely feasible task given the introduction of the social passport of educational institutions in a number of Russian regions. However, even provided that this information is available, it is still inexact and fragmentary, since it is presented on a voluntary basis and there are no generally accepted standards of its collecting and processing. A more common problem is a general distrust of the statistical data reported by the participants of the education system and education authorities, which inevitably reduces the efficiency of their application for management purposes. A well-known example of this is the USE exam results, which many experts believe to be misleading and open to falsification (Bolotov and Valdman 2013).

These existing problems should be resolved. The competitiveness of the Russian education system depends on it. According to international studies, Russia still has much work
to do when it comes to higher standards of education. In certain studies (e.g., PIRLS and TIMSS), Russia leads or is at par with many developed countries, but it is noticeably behind according to others (PISA). In the short-term, it would be better to concentrate on the more tractable issues, which do not require large expenditures (e.g., creating and implementing a systematic unified method of collecting detailed contextual information from all Russian schools). It could well be actualized in the course of monitoring the education system, and incorporated into the framework of the educational initiative “Our New School” (of course, with changes to the composition of the data collection itself), or on the basis of such ambitious, but useful initiatives as the project “Open Government.”

A discussion of the possible models for using contextual data to evaluate educational organizations (including those developed by the Development Center for Social and Economic Development at the Institute of School Education HSE) should involve regional education quality evaluation experts and researches working in the relevant fields. This information would give education authorities a more complete picture of Russia’s education system.

In the future, however, we will inevitably need to move to a more refined system, more sensitive to the dynamics of academic performance and sociodemographic details of each individual student, including the student’s mobility within the education system. This will contribute to the implementation of the most advanced models of education evaluation used in developed countries. Since this step will involve significant financial investment and require the removal of certain legal restrictions, the preparatory work (including the discussion and piloting of possible monitoring models) should begin today in specifically selected regions. We believe this work could be conducted within the existing framework of the federal target program of education development for 2011–15 and the federal program “Development of Education” for 2013–20.
Thus, the Russian system of educational institution assessment faces the following urgent objectives:

- inclusion of contextual data into the general system of information gathering;
- development of the models and tools for collecting contextual data, including the acquisition of national indices;
- account for contextual data when analyzing education performance, including monitoring;
- introduction of standards for the presentation of contextual data in the form of information systems (e.g., websites and public reports).

Only after these simple, but fundamental steps to include contextual data in the evaluation of educational institutions are implemented will it be possible to have a meaningful discussion about the quality control of education. The discussion will center not on pro forma reactionary responses to external signals, but on deliberate approaches built on the analysis of the qualitative data and on the implementation of targeted strategies integral to a coherent national education policy.20

Notes

4. ibid.
5. In 2007, a draft of the National Education Quality Assessment System (see: osoko.ru) was prepared, but has not yet been fully implemented.
6. All information relating to schools and assessment procedures are in the public domain and can be found at the UK Department of Education: <www.education.gov.uk/schools/performance/>.
7. In particular, data are collected on parental occupation and education, primary family language, indigenous relation, and school location.

8. A poverty index is used to calculate the funding school meals plans.

9. For additional information about the contextual information used in education statistics in other countries see our previous publication (Iastrebov et al. 2013, pp. 194–95) and the thematic data of the Organization for Economic Co-operation and Development (OECD 2008, pp. 135–37).

10. The website of the project is www.kpmo.ru. Until the fall of 2014, the monitoring data of almost every school of the Russian Federation were in the public domain. Currently, access is only possible for registered users, or indirectly through a map of educational organizations in Russia (www.educationmap.ru/). The reliability of the data within the system and the adequacy of the methodology of calculating the indicators are the subject of expert discussions.

11. It represents indicators characterizing the financial and economic activities, infrastructure, and staffing of educational institutions, as well as some other information, such as class size, class number, and ratio of teachers to students.

12. A similar procedure can be adapted to identify potentially high-efficiency and low-efficiency schools using other criteria of academic achievement, as it is clear that a comprehensive assessment of a school’s quality will require the use of an expanded list of criteria. The extent of possible criteria can be formed by using the following parameters, which can be calculated for individual sets of students: (1) indicators of differentiation of national testing results—USE; (2) promoting power (Balfanz and 2004), which is calculated as a percentage of students who successfully transition from the 9th to 10th grade; (3) percentage of prizes from Olympiad competition and other contests (other indicators of educational and extracurricular achievements); (4) percentage of students who matriculate to higher education institutions.

13. The ideal case for developing better models is, of course, a national sample of schools, or at least its representation on the basis of a random or some other representative sampling.

14. Since the model demonstrated here describes the difference in USE indicators for one group of students (information on USE results are taken at the school one year prior to graduation) it is significantly simplified. In this situation, the sociodemographic composition of the students should be judged not by the entire student body of school, but only according to the relevant issues; however, the data contained in the social passport of the school make this impossible. This problem is easily resolved if all the characteristics are counted individually. Also in this case it is advisable to take into account the gender composition of the student body, which can also affect the average result due to a higher average of achievement among girls (Voyer and Voyer 2014).

15. Since not all schools fill in the information on the social passport correctly, a smaller number of explanatory variables in the model allows us to include a larger number of educational institutions. If these variables are present in the model and if the connection between them is strong enough, the evaluation of the relevant factors may be biased and as a result, it becomes
impossible to accurately determine the contribution of these variables in the characteristic oscillations of the explanatory trait.

16. One of the main problems in modeling relationships using multiple regression analysis is the potential statistical link (correlation) between the explanatory variables.

17. Direct information about the financing of educational institutions was not used in this case, but it can be taken into account in the construction of similar models.

18. What, unfortunately, cannot be ruled out in the light of the results of the well-known 2013 USE results.

19. See the main results of PISA 2012 (<www.centeroko.ru/public.htm>).

20. For a detailed discussion of different international education programs and projects implemented at the national and regional level, see the thematic collection of articles edited by Froumin et al (2012).

Acknowledgements

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When preparing the article, we tried to take into account all the comments and criticisms relating to the practical application of the education management models presented below.

References


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