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REFLECTIONS ON…

Checking the Possibility of an International Comparative Study of Reading Literacy Assessment for Children Starting School

A. Ivanova, E. Kardanova

Alina Ivanova
Research Fellow, Center for Psychometrics and Measurements in Education, Institute of Education, National Research University Higher School of Economics. Email: aeivanova@hse.ru

Elena Kardanova
Candidate of Sciences in Mathematical Physics, Associate Professor, Tenured Professor, Director of the Center for Psychometrics and Measurements in Education, Institute of Education, National Research University Higher School of Economics. Email: ekardanova@hse.ru

Address: Bld. 10, 16 Potapovsky Lane, 101000 Moscow, Russian Federation

Abstract. The early years of school, when a child is only learning to read, are critically important for later development and learning. Cross-cultural assessments of reading literacy provide a rich source of data for researchers, practitioners and policymakers on the opportunities and prospects of early childhood development in different countries, circumstances and contexts. There are few publications of this sort available, and none of them has involved Russian-speaking children on entry to school so far.

Data obtained using two language versions of the International Performance Indicators in Primary Schools (iPIPS) on representative samples of first-graders from the Republic of Tatarstan and Scotland is used to compare the early reading assessment results between children starting school in countries with linguistic, cultural, and school entry age differences.

Two studies are conducted to analyze the possible methods of comparing assessment results of children from different countries in the absence of a uniform measurement scale. Study 1 uses the rank-ordering method to establish a correspondence between the levels of reading development among Russian- and English-speaking children by expert judgment. In Study 2, the constructed model of literacy levels is used to set the benchmarks of student assessment results.

Keywords: cross-cultural assessment (CCA), elementary school, expert judgment, paired comparison, Rasch modelling.

The role of large-scale national and international assessments (ILSA) has been increasing in developmental research. Recent ILSA allow verifying, adjusting and improving the existing theories of human de-

velopment [Peña 2007; Shuttleworth-Edwards et al. 2004], providing an important source of data on predictors of student achievement in different countries, circumstances and sociocultural contexts [Ainley, Ainley 2019; Carnoy et al. 2016; Caro, Cortés 2012].

The worldwide interest in ILSA is reflected in their number growing rapidly since the early 2000s. For instance, the number of countries participating in the Programme for International Student Assessment (PISA) increased from 43 in 2000 to 80 in 2018 [Liu, Steiner-Khamsi 2020]. Researchers point out that more and more governments internalize the logic of ILSA in their national education policies by attempting to make learning measurable, comparable and accountable [Espeland 2015; Liu, Steiner-Khamsi 2020].

The results of international assessments in preschool and early school education, in particular those measuring early reading literacy, are of major significance to educational researchers and policymakers. Indeed, the role of reading literacy in today's world keeps increasing, and the early years are critical for further reading development. Besides, there is always a demand for rational spending in education. Finally, researchers and policymakers seek to make evidence-based decisions by studying the experience and best practices of other countries [Suggate 2009]. Although each country develops and implements their own education goals and programs, it needs external, international benchmarks and information about new opportunities and prospects for early childhood development [Buzhardt et al. 2019].

The use of research and comparative analysis to enhance education policy is only possible under the condition of reliable and valid measurements in ILSA. Adaptation plays a key role in ensuring valid interpretation of assessment results obtained with instrument versions designed for different countries, languages or cultures. Research institutions administering assessments offer recommendations concerning the procedures intended to provide a high quality of adaptation in ILSA [American Educational Research Association, American Psychological Association, National Council on Measurement in Education 2014; Leong et al. 2016]. The goal of those procedures is to achieve the highest possible level of measurement comparability, which is indispensable for further use of the assessment results.

International comparability of ILSA results is only possible if measurements performed with instruments designed in different languages are equivalent. The concept of measurement equivalence suggests ensuring and empirically validating (i) construct equivalence, (ii) equivalence of instruments, and (iii) equivalence of procedures [Ercikan, Roth, Asil 2015]. Therefore, to minimize possible cultural and linguistic bias in results, the ILSA procedures and methods of instrument design and results validation should guarantee that assessment of relevant behavior (skill, competency or any other construct) is not affected by other variables (nationality or ethnicity, socioeconomic status, etc.).

Instruments designed to measure reading skills are especially difficult to adapt to languages of other countries and cultures. Even the most reputable assessments, such as the Progress in International Reading Literacy Study (PIRLS) and the Programme for International Student Assessment (PISA), face the issue of incomparability across language versions [Goodrich, Ercikan 2019; Kreiner, Christensen 2014]. Furthermore, very few instruments allow for cross-country comparison of emergent literacy.

PIRLS measures reading achievement in elementary school graduates who already know how to read. In the recently initiated first round of the OECD's International Early Learning and Child Well-Being Study (IELS) assessing children on entry to elementary school, which involves only three countries so far, emergent literacy is measured through listening comprehension, vocabulary and phonological awareness [OECD 2020]. The Early Grade Reading Assessment (EGRA), another well-known international project measuring reading acquisition of elementary school students, is not designed to make any cross-country comparisons. Developed in English and adapted to other languages, the instrument is only used at national levels [Dubeck, Gove 2015]. Researchers believe that emergent literacy is hard to measure across cultures because the influence of language in assessment is too strong when children make their very first steps in learning to read [Ercikan, Roth, Asil 2015].

This study attempts to compare reading literacy in children starting school in Russia and the UK using the International Performance Indicators in Primary Schools (iPIPS) test [Tymms 1999]. Originally designed in English, iPIPS is currently applied in a variety of countries, including not only the English-speaking Australia and New Zealand but also, for example, Germany, Brazil and Russia [Bartholo et al. 2019; Kardanova et al. 2018, Tymms et al. 2014; Vidmar et al. 2017].

When developing the Russian-language version of iPIPS, it became obvious that some part of the instrument was inadaptable and had to be localized. Localization involves taking a product and making it linguistically and culturally appropriate to the target locale (country, region, etc.) [Esselink 2000]. The main difference between localization and adaptation is that the former does not imply cross-country comparison of assessment results.

The need for localization was dictated by the essential structural differences between the English and Russian languages, the most important being the verb-centered nature of English and the noun-centered nature of Russian, categorical and functional mismatches in parts of speech between the languages, fixed word order in English, and a number of others. Because of those gaps, the stages of language development do not coincide for English- and Russian-speaking children [Ivanova, Kardanova-Biryukova 2019], which undoubtedly affects the process of reading acquisition and assessment.

In an earlier study [2019], we described the procedures used for localizing the Russian-language version of the iPIPS reading test, demonstrated the means of ensuring equivalence of construct— emergent reading literacy on school entry—at the stage of localization design, substantiated the impossibility of achieving full measurement equivalence, and described the procedures of collecting evidence of construct validity.

The first step towards creating a Russian-language version of iP-IPS consisted in translation and expert evaluation of items designed to assess the basic reading skills of British children. Translation (forward and backward) was performed in compliance with the guidelines of the International Test Commission [Leong et al. 2016]. The iP-IPS reading test was comprised of a few modules corresponding to the stages of reading development in the iPIPS theoretical model: text structure awareness, letter identification, word recognition, and reading/decoding automaticity.

Items assessing reading skills were fairly easy to localize for Russian-speaking children. Meanwhile, localization of the reading comprehension module turned out to be a challenge. This module included large narrative texts with hidden "traps"—gaps to be filled in by choosing one of the three words suggested. The "traps" targeted different aspects of language—spelling, grammar, phonology and semantics. Since the texts offered to Russian- and English-speaking children had to be of comparable difficulty and the "traps" had to evaluate the same competencies, much more effort was spent localizing this module.

Specifically, the process involved first analyzing the linguistic characteristics of the original text, then finding equivalent "traps" in Russian and, finally, producing a Russian-language text with "traps" and content close to the English-language original.

Although localization of an international instrument into Russian does not imply direct comparison of student outcomes, there is a demand for comparing children's basic skills on school entry, which can be satisfied by indirect comparison, understood here as comparison of assessment results in a cross-cultural context at the level of groups, not individuals.

This article aims at exploring the possibility of a cross-country assessment of emergent literacy in children starting school in Russia and the UK. Two studies are conducted for this purpose. Study 1 uses the rank-ordering method to establish a correspondence between the levels of reading development among Russian- and English-speaking children by expert judgment. In Study 2, the constructed model of literacy levels is used to establish the benchmarks of student assessment results in the two jurisdictions. This series of studies will render possible comparison of first-graders' reading test results between Russia and the UK for the first time.

1. Study 1. The Rank-Ordering Method as a Basis for Comparison

Expert evaluation of the construct—the model of literacy levels in Russian- and English-speaking children—was performed as part of analysis of comparative assessment opportunities using the rank-ordering method as a methodological framework.

This method was applied in a study comparing the raw marks of two tests for 14-year-old students in England [Bramley 2005] on different cohorts and different panels of experts. It represents a combination of expert judgment and mathematical modelling of judgmental data and allows comparing the test results between different versions of the instrument where no full measurement equivalence can be achieved.

The goal of Study 1 is to show how expert judgments can be used for building a reading literacy scale, identifying the item-difficulty hierarchy for the construct measured, comparing item hierarchies between two language versions and establishing the benchmarks.

1.1. Methodology of Study 1
1.1.1. Item Selection

The study uses the original English-language version of the 44-item iPIPS reading test [Merrell, Tymms 2007] with 18 "traps" in the reading comprehension module and the localized 40-item Russian-language version of the instrument [Ivanova, Kardanova-Biryukova 2019] containing 14 reading comprehension "traps".

1.1.2. Participants

The study was assisted by twelve experts speaking fluent English, including teachers and professors of English, linguists and philologists, all with at least a Master's degree and with two to over ten years of professional experience, of whom one was male and eleven were females.

1.1.3. Procedure

Prior consent to participate in the study was obtained from all experts. Each of them was given two packs with versions of the test in Russian and English, judgment instructions, and a short questionnaire.

Every item was represented as a picture on a separate sheet of paper with instructions that were given to children starting school in Russia and the UK and a short notice of what the item measured. Instructions for experts also contained information on the testing procedure. In addition, experts were provided a link to the video demonstrating the testing process.

The experts were notified that the items were randomly intermixed within their language-specific packs. They were asked to rank the items from the easiest to the most difficult within each pack by giving their personal holistic assessment of item difficulty based on their expert knowledge and experience. They were also asked to allow a minimum of two days between evaluations of the Russian- and English-language versions.

1.1.4. Analytical Approach

Rank-ordered data have characteristics that are in line with the family of Rasch measurement models. Ranks are observations of elements

implying qualitatively more, ordered along an implicit or explicit variable [Linacre 2006]. A single set of ranks, called a "ranking", contains enough information to order the elements. If there are two or more rankings of the same elements, then there may be enough information to construct interval measures of the distances between the elements. Interval measures allow assessing the difficulty of every item by fixing a zero point (e. g. at the mean difficulty of all items, as in Rasch modelling), which means that they support inferences about measurement results and investigation into the consistency of particular rankings [Linacre 2006].

John M. Linacre [Linacre 1989; 2006] developed two approaches to modelling ranked-ordered data based on the method of paired comparison proposed by Louis L. Thurstone [Thurstone 1927]:

1) Decomposing the rank orderings into paired comparisons, e. g. a rank-ordering of 10 objects yields 45 paired comparisons for analysis: 1st against 2nd, 1st against 3rd, etc.;

2) Modelling each ordering as a partial-credit item.

The dataset for subsequent analysis includes 1,008 observations: 12 experts evaluated a pack of 44 items, plus 12 experts evaluated a pack of 40 items. For each expert, ranking of the items within each language version of the instrument represents a set of ranks. Both approaches proposed by Linacre are used to build an early reading development scale based on expert judgments.

Let us dwell on the method of paired comparison first. In the simplest case where items are ranked by paired comparisons, items are compared in pairs and ordered according to their ranking. In each ordering, any particular item is ranked higher or lower than any other particular item. What is decisive is the number of times one item is ranked higher than another [Linacre 1989]. Otherwise speaking, item n with measure B_n might be ranked HIGHER than item m with measure B_m a total of H times across the orderings made by the different experts. In contrast, item n might be ranked LOWER than m a total of L times. The ratio H/L is the essential data for the estimation of a distance between items n and m as in $(B_n - B_m)$.

A measurement model for rank orders is

$$Ln\ (P_{nm}\ /\ P_{mn}) = B_n - B_m\ ,$$

where P_{nm} is the probability that n is ranked higher than m, P_{mn} is the probability that m is ranked higher than n, and $P_{mn} + P_{nm} = 1$.

The ratio $P_{nm}\ /\ P_{mn}$ becomes the empirical data for estimating the parameters. For rankings of more than two items, there are added constraints because items are not compared independently, but are reported in a composite rank-order.

In the model proposed by Linacre for Thurstone's method of paired comparison (hereinafter TM—for Thurstone Model), rank or-

derings are decomposed into paired comparisons. A measurement model for this conceptualization is

$$Ln\ (P_{nrk} / P_{nrk+1}) = B_n - B_r - F_{rk},$$

where P_{nrk} is the probability that, in ordering r, item n will be ranked k, P_{nrk+1} is the probability that, in ordering r, item n will be ranked $k + 1$, B_n is the difficulty of item n, B_r is the mean difficulty of the items included in ordering r, F_{rk} is the step difficulty up from a ranking of $k+1$ to a ranking of k within ordering r.

A delight of this measurement model is that it doesn't matter, in general, how many experts include each item in their rankings, or how many items each expert ranks. The estimates of the measures are derived merely from counting each item's location in each ordering [Linacre 1989].

The other approach suggests modelling each ordering as a polytomously-scored response, where the number of response options corresponds to the number of ranks assigned in an ordering. Analytically, this is implemented as follows: 12 expert rankings (by the number of orderings made by 12 experts) will represent "items", and actual items in the English- and Russian-language versions of the instrument will be treated as "persons". This is where the Partial Credit Model (PCM) [Masters 1982] can be applied.

This approach was used by Tom Bramley [Bramley 2005], who fitted the PCM model specifically for equating tests by expert judgment:

$$Ln\ (P_{nrk} / P_{nr(k+1)}) = B_n - D_{rk},$$

where P_{nrk} is the probability that item n is ranked at position k in ranking r; $P_{nr(k+1)}$ is the probability that item n is ranked at position $k + 1$ in ranking r; B_n is the difficulty of item n; and D_{rk} is the difficulty of reaching the scale category k relative to category $k + 1$ in ranking r.

Analysis of our data was performed in the logic of both approaches using FACETS [Linacre, Wright 1994] and Winsteps [Linacre 2011] software, respectively.

1.2. Results of Study 1

Agreement among the judgments of all experts was analyzed to ensure sufficient reliability of the data collected. Kendall's coefficient of concordance, a classic measure of agreement among raters [Field 2014], was 0.84 for the Russian-language version and 0.87 for the English-language one. Consequently, there is a high agreement among the estimates of item difficulty made by the experts.

Next, the results of rank-order judgments were presented separately for each language version of the instrument within the two models described above, TM and PCM. Data analysis yielded similar results with both approaches. A summary of item analysis results is given in Table 1. The standard error for item difficulty (Model S. E.)

Table 1. **General scale parameters**

Model	Measures of quality			
	Goodness-of-fit statistics			
	INFIT MNSQ	OUTFIT MNSQ	Model S.E	Range of Measures
Russian-language version				
TM	1.0	0.6	0.16	9.86
PCM	1.3	1.3	0.07	2.99
English-language version				
TM	1.0	0.9	0.16	11.24
PCM	1.04	1.04	0.07	3.41

is rather small (especially for PCM). At the same time, the range of item difficulties (Range of measures), according to expert judgments, is much wider for TM. Goodness-of-fit statistics, designated as INFIT and OUTFIT MNSQ, serve as indicators of how well the chosen measurement model predicts the dataset and represent root-mean-square deviations of empirical values from those predicted by the model for each rank. As can be seen from Table 1, mean-squares of the goodness-of-fit statistics fall within the range [0.6; 1.4] recommended by psychometricians [Linacre 2011].

Table 2 shows data broken by items, namely the level of item difficulty in both language versions according to expert judgments, the standard error of item difficulty estimate, and goodness-of-fit statistics showing how well the data fits the measurement model.

It can be inferred from Table 2 that the data basically fits both models for both language versions. There is a very high correlation between the levels of item difficulty in each language version analyzed with different approaches, Pearson's correlation coefficient between the TM and PCM judgments being 0.95 ($p < 0.05$) for the Russian-language version and 0.96 ($p < 0.05$) for the English-language one.

It is convenient to illustrate the item-difficulty hierarchy using variable maps for the two versions of the instrument shown in Figures 1 and 2. The maps are built using the PCM approach (the ones based on TM have a similar appearance). The easiest items (letter identification tasks) can be found at the bottom; the items assessing text structure awareness and word recognition skills are just above; the middle part of the scale (around 0 logits) displays the items measuring reading/decoding automaticity; finally, the most difficult tasks for reading comprehension are at the top.

Both maps feature item clustering at the top, middle and bottom of the scale. Moreover, the distances on the continuum between the boundary items of the top and middle clusters as well as the middle

Table 2. **Expert judgments of item difficulty for two language versions**

Item	Task description	Russian-language version						English-language version					
		PCM			TM			PCM			TM		
		MEASURE	S.E	INFIT	MEASURE	S.E	INFIT	MEASURE	S.E	INFIT	MEASURE	S.E	INFIT
Task01	Text structure 1	−1.5	0.2	2.0	−2.6	0.1	1.4	−1.8	0.2	1.7	−3.4	0.2	1.5
Task02	Text structure 2	−1.0	0.1	0.7	−1.9	0.1	1.3	−1.5	0.1	0.6	−2.5	0.2	1.4
Task03	Text structure 3	−1.2	0.1	1.5	−2.6	0.1	1.5	−1.1	0.1	3.1	−2.6	0.1	1.5
Task04	Text structure 4	−1.0	0.1	0.3	−2.2	0.1	1.3	−1.4	0.1	0.4	−3.1	0.1	1.4
Task05	Text structure 5	−1.0	0.1	0.7	−1.9	0.1	1.3	−1.4	0.1	0.8	−2.6	0.1	1.5
Task06	Letters 1	−1.2	0.1	0.5	−4.4	0.2	0.9	−1.5	0.1	0.6	−6.2	0.2	1.2
Task07	Letters 12	−1.0	0.1	0.3	−4.2	0.2	1.1	−1.3	0.1	0.2	−4.7	0.2	0.9
Task08	Letters 13	−0.9	0.1	0.3	−5.2	0.2	1.1	−1.3	0.1	0.6	−5.3	0.2	1.0
Task09	Letters 14	−0.9	0.1	0.7	−3.4	0.2	0.9	−1.2	0.1	0.6	−5.1	0.2	1.0
Task10	Letters 15	−0.8	0.1	0.5	−3.5	0.2	0.8	−1.2	0.1	0.4	−4.3	0.2	0.8
Task11	Letters 16	−0.6	0.1	1.1	−3.5	0.2	0.9	−1.1	0.1	0.2	−4.7	0.2	0.9
Task12	Letters 17	−0.8	0.1	0.4	−3.2	0.2	0.7	−1.1	0.1	0.2	−4.3	0.2	0.8
Task13	Letters 18	−0.7	0.1	0.5	−3.0	0.1	0.7	−1.0	0.1	0.4	−3.9	0.2	0.7
Task14	Letters 19	−0.7	0.1	0.3	−3.0	0.1	0.8	−1.1	0.1	2.3	−4.0	0.2	0.7
Task15	Words 1	−0.6	0.1	0.8	−1.8	0.1	0.8	−1.0	0.1	2.8	−3.0	0.1	0.6
Task16	Words 2	−0.6	0.1	0.8	−1.2	0.2	0.9	−1.0	0.1	1.9	−2.0	0.2	0.8
Task17	Words 3	−0.6	0.1	0.2	−1.0	0.2	0.9	−1.0	0.1	2.7	−1.8	0.2	0.8
Task18	Words 4	−0.5	0.1	1.5	−2.0	0.1	0.7	−0.8	0.1	0.5	−3.0	0.1	0.6
Task19	Words 5	−0.8	0.1	1.4	−1.5	0.1	0.9	−0.9	0.1	0.3	−2.1	0.2	0.8
Task20	Words 6	−0.9	0.1	3.1	−1.0	0.2	0.9	−0.8	0.1	0.6	−2.5	0.2	0.7
Task21	Words 7	−0.9	0.1	2.4	−0.5	0.2	0.9	−0.8	0.1	0.5	−1.1	0.2	0.9
Task22	Words 8	−0.8	0.1	2.3	−2.0	0.1	0.8	−0.9	0.1	0.5	−1.5	0.2	0.9
Task23	Words 9	−0.8	0.1	2.5	−0.9	0.2	0.9	−0.7	0.1	1.1	−1.7	0.2	0.9
Task24	Story, Part 1	0.4	0.1	6.3	1.0	0.2	1.1	0.1	0.2	0.8	0.7	0.2	0.6
Task25	Story, Part 2	0.7	0.1	5.1	1.5	0.2	1.2	0.2	0.2	0.5	0.7	0.2	0.5
Task26	Story, Part 3	0.8	0.1	3.4	1.9	0.2	1.1	0.2	0.2	1.4	0.5	0.2	0.6
Task27	"Trap" text 1	1.1	0.1	1.1	2.7	0.2	1.0	1.3	0.1	1.5	4.2	0.2	1.0
Task28	"Trap" text 2	1.2	0.1	0.7	4.0	0.2	1.0	1.0	0.1	1.4	3.4	0.2	1.4
Task29	"Trap" text 3	1.3	0.1	1.1	3.9	0.2	0.9	1.3	0.1	3.0	4.6	0.2	0.9
Task30	"Trap" text 4	1.4	0.1	0.9	3.6	0.2	0.9	1.4	0.1	0.7	4.2	0.2	1.0
Task31	"Trap" text 5	1.2	0.1	1.1	3.3	0.2	1.0	1.4	0.1	1.3	4.3	0.2	1.0
Task32	"Trap" text 6	1.4	0.1	0.8	4.1	0.2	1.0	1.2	0.1	0.6	4.4	0.2	1.0
Task33	"Trap" text 7	1.3	0.1	1.0	3.4	0.2	0.9	1.5	0.1	0.5	4.1	0.2	0.9
Task34	"Trap" text 8	1.3	0.1	1.1	3.1	0.2	0.9	1.5	0.1	0.8	5.0	0.2	1.0
Task35	"Trap" text 9	1.5	0.1	0.6	3.8	0.2	1.0	1.3	0.1	1.4	3.0	0.2	0.8
Task36	"Trap" text 10	1.4	0.1	0.9	3.6	0.2	0.9	1.5	0.1	1.0	4.4	0.2	1.0
Task37	"Trap" text 11	1.3	0.1	0.8	4.2	0.2	1.0	1.2	0.1	2.2	4.5	0.2	1.0
Task38	"Trap" text 12	1.1	0.1	1.5	3.3	0.2	1.0	1.5	0.1	0.7	2.4	0.2	0.8
Task39	"Trap" text 13	1.2	0.1	0.8	4.6	0.2	1.0	1.4	0.1	0.9	4.7	0.2	1.0
Task40	"Trap" text 14	1.3	0.1	0.7	4.1	0.2	1.0	1.5	0.1	0.8	4.8	0.2	1.0
Task41	"Trap" text 15							1.4	0.1	0.9	3.6	0.2	1.0
Task42	"Trap" text 16							1.6	0.1	0.4	3.1	0.2	1.3
Task43	"Trap" text 17							1.6	0.1	0.9	5.0	0.2	1.0
Task44	"Trap" text 18							1.5	0.1	1.1	3.5	0.2	1.0

Note: In FACETS, estimates of item difficulty are presented as those of item "easiness".
For presentation, they were converted into estimates of item difficulty.
Item difficulty is measured in logits—specific units of measurement on a log-odds scale adopted in Item Response Theory.

Table 3. **Differences in item difficulty for grouping**

Difference in difficulty between boundary items in logits	Russian-language version	English-language version
Task24—Task23	1.9	2.5
Task26—Task25	0.8	3.7

and lower ones are large enough (Table 3), falling significantly outside the range of two standard errors, which means that the clusters represent three major groups of tasks corresponding to different levels of reading development.

Therefore, expert judgments of item-difficulty hierarchy for two language versions of the iPIPS instrument were obtained in the course of this study. A psychometric analysis of expert judgments using two measurement approaches allowed distinguishing among three clusters of items differing within the range of two standard errors by difficulty for both language versions of the iPIPS reading assessment test, represented by the same groups of items in both Russian and English.

The first cluster (at the bottom of the map in Figures 1 and 2) includes the easiest test items measuring text structure awareness as well as letter identification and word recognition skills. This cluster corresponds to the earliest stage of reading development. The second cluster (middle part of the map) includes items of medium difficulty, which assess reading/decoding automaticity in both language versions. Finally, the third cluster (top of the map) is comprised of reading comprehension tasks.

The identified clusters of items constitute empirical evidence on applicability of the theoretical model of reading development underlying the original version of iPIPS to the Russian-language version. The clusters can be used as a uniform basis for setting comparable benchmarks on the reading scales of the two language versions of the instrument.

2. Study 2. Establishing the Benchmarks for Comparing Samples of Russian- and English-Speaking Students by Reading Development

It was impossible to achieve full reading measurement equivalence in the course of adapting/localizing the iPIPS instrument into Russian [Ivanova, Kardanova-Biryukova 2019], which makes it impossible to compare student performance between the two countries directly. Nevertheless, using the actual results of tests administered under equivalent procedures in the two countries and having confirmed the possibility of using a uniform model of early reading literacy levels (Study 1), one may attempt to carry out an indirect cross-country comparison of student achievements. In particular, the principles of

Figure 1. **Variable map for the Russian-language version.** *Partial Credit Model. Winsteps*

```
Expert - MAP - Task
    <rare>|<more>
     2    +
          |
          |
          |
          |
          |   task35
          |   task32  task36
          |   task29  task30  task33  task34  task37  task40
          |   task28  task31  task39
          |   task27  task38
     1    +S
          |
          |   task26
          |   task25
          |
          |   task24
          |
          |
     0    M+M
          |
          |
          |
          |   task18
          |   task11  task15  task16  task17
          |   task13  task14
          |   task10  task12  task19  task22  task23
          |   task08  task09  task20  task21
    -1    +S task02  task04  task05  task07
          |
          |   task03  task06
          |
          |
          |   task01
          |
          |
          |
    -2    +
     <frequ>|<less>
```
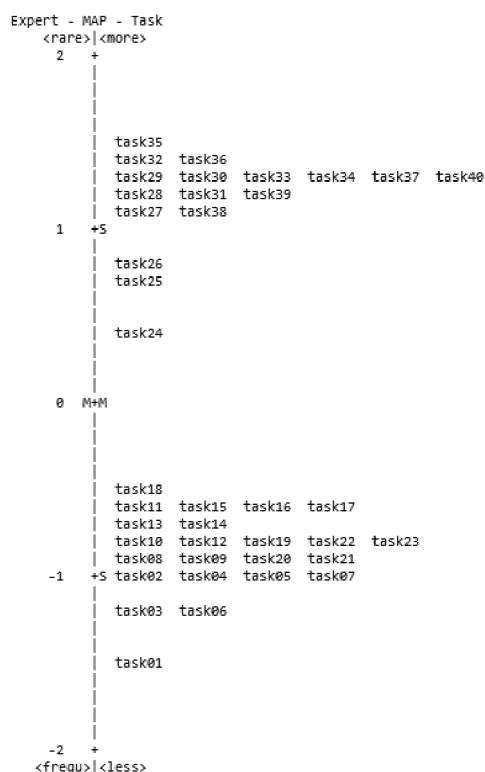
Figure 2. **Variable map for the English-language version.** *Partial Credit Model. Winsteps*

```
Expert - MAP - Task
    <rare>|<more>
     2    +
          |
          |
          |
          |   task42  task43
          |   task33  task36  task38  task40  task44
          |   task30  task31  task34  task39  task41
          |   task27  task29  task35
         |S task32  task37
          |
     1    +   task28
          |
          |
          |
          |
          |
          |   task25  task26
          |   task24
     0    M+M
          |
          |
          |
          |
          |   task23
          |   task18  task20  task21
          |   task19  task22
    -1    +   task13  task15  task16  task17
          |   task03  task11  task12  task14
         |S task09  task10
          |   task07  task08
          |   task04  task05
          |   task02  task06
          |
          |   task01
          |
    -2    +
     <frequ>|<less>
```
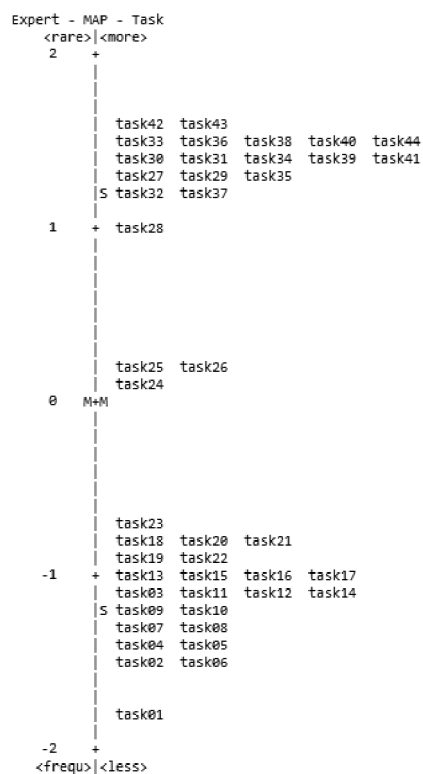
Rasch measurement models allow comparing samples of students in different countries according to the level of reading development.

The study uses empirical data obtained from samples of first-graders on entry to school in the Republic of Tatarstan and Scotland as reference data for the Russian- and English-language versions, respectively. The items used below in this article have been described in Study 1.

2.1. Methodology of Study 2

2.1.1 Sampling

In Russia, all the necessary data for sampling were collected in cooperation with the Republican Center of Education Quality Monitoring of the Republic of Tatarstan in 2017. A representative sample of over 5,000 children (44% of total population) was produced. For this sample, total population is understood as all first-graders in the selected regions of Tatarstan. The sample was stratified by school type and location. Classes of students selected randomly from the cohort of first-graders of a particular participating school served as sampling units. The study only involved children whose parents had given their

consent to participation. The total sample of first-graders whose results will be used for analysis below was comprised of 4,940 students aged on average 7.4 on school entry.

The sample of children from the UK in this study consisted of 6,627 Scottish students, which was a representative sample for Scotland (data for the 2014/15 academic year) [Tymms, Merrell, Buckley 2015]. The average age of children on entry to school was 5 years, although a certain percentage of older children was observed.

2.1.2. Analytical Approach to Comparative Assessment

Based on Georg Rasch's principles of measurement, we suggest treating the test results as a continuum of reading development, some kind of a "path" that leads toward reading comprehension, while drawing on the iPIPS theory of reading development and the model of literacy levels constructed as a result of analyzing expert estimates of item difficulty in Study 1.

Using the scale of expert judgments of early reading assessment item difficulty, transformed in the course of modelling into a logit scale, we identified three clusters of items, or three theoretically interpretable stages of reading development confirmed by expert judgments. The model proposed here allows distinguishing among the levels of reading development, from zero level where children make their very first steps in learning to read, to the advanced level of reading comprehension.

Next, we can check how well the empirical item hierarchy fits the expert rankings and the constructed model of literacy levels. If psychometric analysis reveals item clustering that agrees with the model of literacy levels, it will be possible to set the benchmarks of transition between the levels of reading acquisition.

All items that fall into each cluster identified in Study 1 can be regarded as a separate subtest representing a certain level of literacy. To establish the benchmark scores, it is important to determine the criterion for transition from one level to another. Drawing on theoretical findings of Russian researchers [Bespalko 1989], we assume that a hypothetical level of skill development can be considered as achieved if at least 70% of items at this level are answered correctly (probabilistic estimation). According to this concept, acquisition of learning material by 70% indicates that a student is ready to learn new material and that a skill has been acquired.

The benchmarks for transition from one level of reading development to another were established using the methods of Item Response Theory. Three hypothetical items were formed to represent each level. Difficulty of each of the three items was estimated as the mean difficulty of all items at the relevant level. Next, a benchmark score was set for achieving each level on the literacy scale as a level of skill at which the probability of answering the hypothetical "average" item correctly is 0.7 (the 70% cutoff score for skill acquisition adopted above). All participants performing below this score should

Table 4. **Reliability analysis of empirical data**

Properties	Cronbach's α	Person Reliability	Person Separation
Russian-language version	0.97	0.87	2.56
English-language version	0.75	0.71	1.58

be considered to have not acquired the respective level as well as all the subsequent ones.

2.2. Results of Study 2 Applying the analytical approach described above, let us analyze the results of a preliminary psychometric analysis of available empirical data and graphically compare the item-difficulty hierarchies obtained for the Russian- and English-language versions of the test by expert judgments vs. actual testing. The one-parameter Rasch model for dichotomous data was used to convert raw scores into measures of reading literacy [Wright, Stone 1979]. Psychometric analysis of the items, analysis of scale dimensionality and reliability, and a goodness-of-fit test were carried out. Winsteps software [Linacre 2011] was used for psychometric analysis and assessment of item and person parameters.

Table 4 presents general psychometric properties of literacy scale quality for empirical data obtained on student samples in Russia and the UK.

Both versions of the instrument yield highly reliable scores as indicated by both the classical and Rasch (person) reliability statistics and feature quite a high level of scale sensitivity (person separation) that allows grouping examinees into a minimum of three clusters[1] according to their level of reading literacy.

Having tested the psychometric quality of the literacy scale on a sample of students from Russia and the UK, we can examine the item hierarchy on variable maps and compare it to the one in Study 1 (Figures 3 and 4). In Figures 3 and 4, the items are shown on the right and the distribution of persons is shown on the left.

Although demarcations between the item clusters along the axis on the variable maps is less clear than in the case of expert judgments, the general structures of the clusters are identical. The easiest items measuring text structure awareness (I1–I5), letter identification (L1–L8) and word recognition (W1–W9) are at the bottom of the map, which corresponds to the items of the first cluster in Study 1. Items meas-

_____

[1] To determine how many measurement strata could be statistically distinguishable among the examinees, we use the separation index formula and the procedure described in Winsteps tutorial [Linacre 2011].

Figure 3. **Variable map. Test results of English-speaking students**


```
        Person - MAP - Item
              <more>|<rare>
     7               +
                  .  |
                     |
                     |
     6            .  +
                     |
                  .  |
                     |
     5            .  + U16
                  .  | U9
                  .  |
                  .  |
     4            .  + U15   U7
                  .  | U10   U11   U12   U13   U17   U2    U4    U5
                     U8
                  .  |S U14  U18   U6
                  .  | U3
     3            .  + U1
                  .  |
                  .  |
                  .  |
     2               + S3
                     | S2
                  .  |
                  .  |
     1               + S1
                  .  |
                  .  |
                     |
     0            .  +M
                  .  |
                 T|   W8
                  . |  W7    W9
    -1          .#  +
                .#  |
                    |  L7    L9
                .#  |  L8
    -2          .#  + W6
                .#  |  W5
               .##  |  W4
               .## S|
    -3         .##  + I3    L6
               ###  |  L5
               .##  |S I2   L4
              .###  |  I4    W1    W2    W3
    -4       .####  + I5
           .######  |
           .######  |
                  M|
    -5      .#######  + I1   L3
           .########  |
                    |
                    |
    -6    .##########  + L2
                    |
        .#############  |
                  S|
    -7               +
                    |T
                    |
        .#############  | L1
    -8      .#####  +
              <less>|<frequ>
```
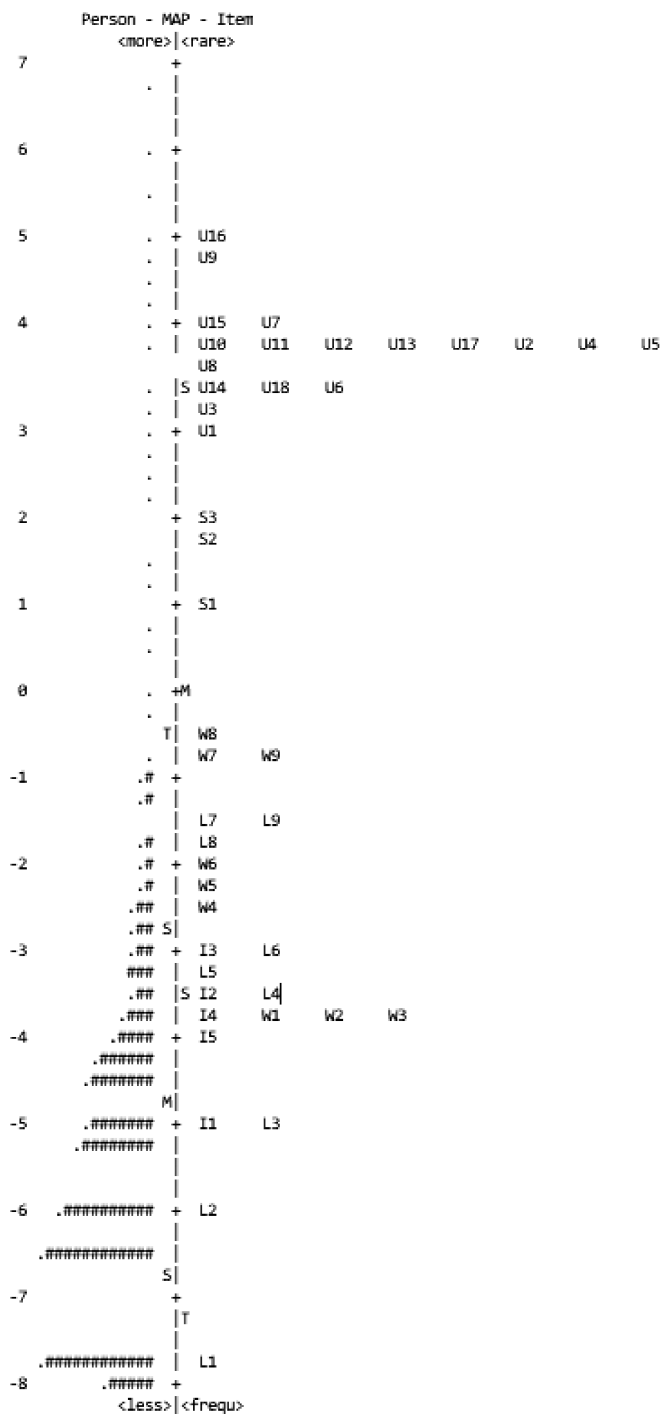
Figure 4. **Variable map. Test results of Russian-speaking students**

```
         Person - MAP - Item
              <more>|<rare>
  6          .####   +
                     |
                     |
         .#######    |
                     |
  5                  +
                     |
       .##########   |
                     |
                     |T U11
  4 .############ S+
                     |
      .############  |   U13
                     |   U10
     .############   |
  3    .##########   +   U8
                     |
     .############   |   U14     U9
       .#########    |
         .#######   |S U5      U6
  2        .####    +  U1      U12
                     |
            .### M|   U2      U3      U4
             .##  |
             .#   |   U7
  1          .##   +
             .#   |   S3
             .##   |   S1
            .####  |   S2
           .#####  |
  0        .#####  +M I2
           .#####  |
           .#####  |   W7      W9
           .#### S|   I4      W6
           .####  |   I5
 -1         .###   +   I1      L7      L8
            .###   |   L6
            .###   |   W8
            ###   |
             .##  |   L4
 -2          .##   +   L3      L5
             .#  |S W1
             .#   |   W3
             .#   |   W2      W4      W5
             .#   |   L2
 -3              T+
             .#   |   L1
             .#   |
                  |   I3
             .#   |
 -4               +
                  |T
           .      |
                  |
                  |
 -5               +
           .      |
                  |
                  |
                  |
 -6          .    +
              <less>|<frequ>
```
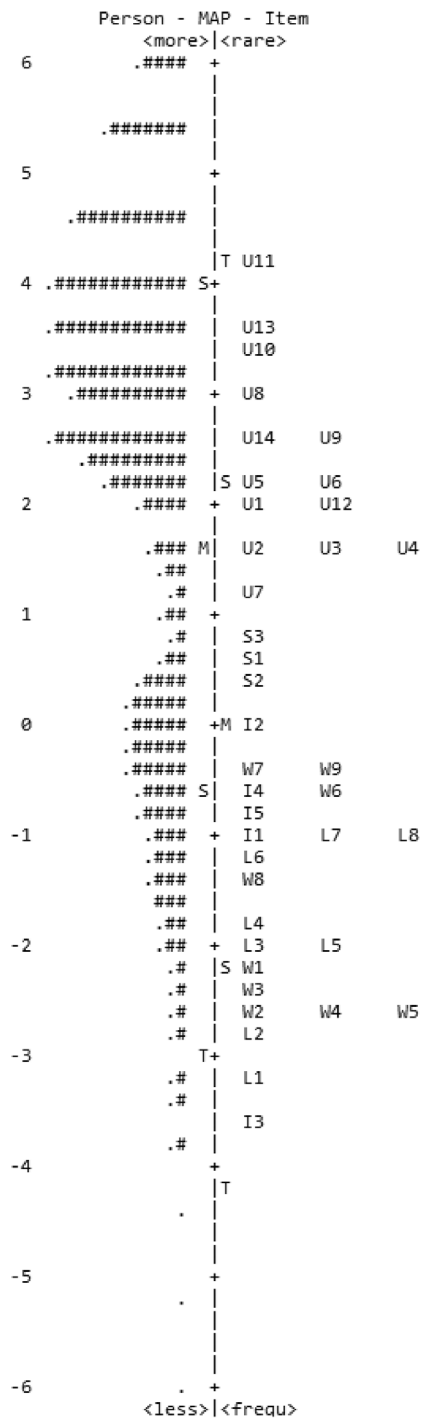
Table 5. **Setting the benchmarks**

Level benchmarks	Sample			
	Russia		UK	
	Mean item difficulty	Benchmark score	Mean item difficulty	Benchmark score
Level 3 benchmark Reading comprehension	2.11	2.96	3.78	4.63
Level 2 benchmark Reading/decoding automaticity	0.61	1.46	1.53	2.38
Level 1 benchmark Text structure awareness, letter identification, sight word recognition	−1.63	−0.78	−3.16	−2.31

Note: Benchmark scores in the table are presented in logits, but they can easily be converted to any scale for presenting test results, for example, a 100-point scale.

uring reading/decoding automaticity (S1–S3) are in the middle of the map, and those assessing reading comprehension (U1–U14) are at the top, corresponding to the third cluster.

To assess how well expert judgments of item difficulty in each language version reflect the item hierarchy on the literacy scale, we conducted a correlation analysis of item difficulty estimates obtained by expert judgment and actual testing. Pearson's correlation coefficients were found to be high enough, 0.81 for the Russian-language version and 0.88 for the English-language one.

Therefore, analysis of the available empirical and expert data confirms the possibility of using the constructed model of literacy levels as a basis for setting benchmarks and conducting an indirect cross-country comparison.

As a result of the procedure described in the analytical approach section, benchmarks on the literacy scale were determined, setting the boundaries of reading acquisition levels (Table 5), which can be applied uniformly to children's test results in the two language versions of the instrument.

Setting of benchmarks for the Russian-language version of the test is illustrated in Figure 5. The level of examinees' literacy in logits is plotted on the abscissa axis, while the ordinate axis displays the probability of answering the item correctly. The three curves correspond to the characteristic curves[2] of the three hypothetical items reflecting mean item difficulty at the respective level. The horizontal line reflects the accepted 70% cutoff score of level acquisition. Benchmark

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[2] An item characteristic curve reflects the probability of answering the item correctly depending on the level of literacy.

Figure 5. **Setting the benchmark scores for levels of reading development among the examinees**
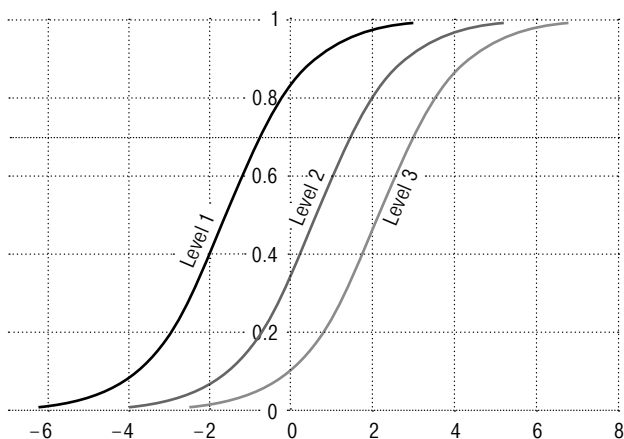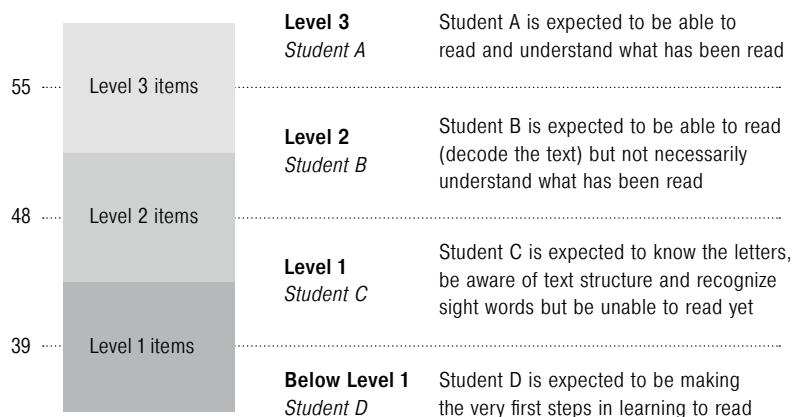(Russian-language version of the test)

Figure 6. **Categorization of benchmark scores**
(example for the Russian-language version of the test)

		Level 3 *Student A*	Student A is expected to be able to read and understand what has been read
55	Level 3 items		
		Level 2 *Student B*	Student B is expected to be able to read (decode the text) but not necessarily understand what has been read
48	Level 2 items		
		Level 1 *Student C*	Student C is expected to know the letters, be aware of text structure and recognize sight words but be unable to read yet
39	Level 1 items		
		Below Level 1 *Student D*	Student D is expected to be making the very first steps in learning to read

scores are defined as abscissae of the points of intersection between the horizontal line and the item characteristic curve for each level of reading development.

Figure 6 shows the literacy scale with the benchmark scores converted into a 100-point scale which is used to present test results (in *z*-scores with the mean of 50 and standard error of 10). The resulting benchmarks are as follows: 39 for acquiring Level 1, 48 for Level 2, and 55 for Level 3.

Table 6. **Comparing the distribution of students by the levels of literacy on school entry between Russia and the UK**

Level of reading development	Level description	Share of the sample, %	
		Russia	UK
Level 3	Reading comprehension	32.7	0.3
Level 2	Reading/decoding automaticity	27.7	0.6
Level 1	Letter identification, sight word recognition, text structure awareness	23.8	9.9
Below Level 1	The very first steps in learning to read	15.9	89.2

2.2.1. Using the Benchmark Scores for Comparative Assessment

Therefore, Study 2 established the benchmarks setting the boundaries between the levels of reading development in each of the two language versions of the instrument. Taken together, the results of the two studies confirm the possibility of conducting a cross-cultural assessment of reading skills in groups of children starting school. Table 6 shows the distribution of students in Russia and the UK by the levels of reading development.

The distribution of students by the levels of reading development differs greatly between the two countries. Interpretation of the results obtained is beyond the scope of this article, but it is worth noting that the samples analyzed here differed significantly in examinee age, which may be the reason for considerable disparities in student achievement. The most important finding of Study 2, meanwhile, is that the methodology described in it can be used for indirect cross-country comparisons in the absence of a uniform metric scale.

3. Discussion

To make data from cross-country assessments reliable for educational researchers, policymakers and practitioners, it should be verified for credibility, validity and meaningfulness, and evidence should be provided that it adequately represents the construct measured and can serve the basis for informed decision making. The ITC Guidelines for Translating and Adapting Tests [Leong 2016] were applied when creating the Russian-language version of the iPIPS test that had been originally designed in English.

The iPIPS instrument is widely used by schools in the UK as well as in several other countries, including Australia, Brazil, Germany and South Africa [Archer et al. 2010; Bartholo et al. 2019; Tymms et al. 2014; Vidmar et al. 2017]. In some earlier publications, it was used to measure student performance across cultures, e. g. in the UK, Australia and New Zealand [Tymms et al. 2014], where the authors tried to assess

possible differences in academic achievement and progress as well as the effectiveness of education systems.

Another study tested the potential of iPIPS for comparing math test scores between children in the UK (England, Scotland) and Russia, countries differing in school entry age, curricula, language and culture [Ivanova et al. 2018]. It is shown that, despite the obvious challenges, direct cross-country comparison of iPIPS test results in mathematics is not impossible.

In yet another study [Vidmar et al. 2017], reading progress of first-graders in Serbia and Germany was compared using the iPIPS instrument. However, this article only deals with sample means and provides no evidence of cross-national comparability.

Up to this point, there have been no studies using the iPIPS instrument to compare the reading test results of students starting school in different countries.

This study attempts to solve the challenging research problem of international assessment of reading ability on school entry using the test results of first-graders in Russia and the UK. Study 1 analyzed the expert judgments on the construct, i.e. the model of literacy levels in Russian- and English-speaking children starting school, using the rank-ordering method.

A cross-country comparison of item-difficulty hierarchy obtained as a result of data calibration using two Rasch modelling frameworks shows that three item clusters can be distinguished in both language versions. These clusters are represented by the same items in both Russian and English.

Study 1 demonstrates that expert judgments of the difficulty of items measuring emergent literacy on school entry can be used to build an item hierarchy along the construct continuum, to compare item hierarchies between the two language versions, and, finally, to form the basis for setting benchmarks between the levels of reading development in two languages, Russian and English.

Study 2, using test results obtained from the samples of Russian- and English-speaking students in the two countries, sets the benchmarks and determines the levels of reading development. Those levels are applied in a uniform manner to the reading test results in both language versions of the instrument to group children in both countries into categories according to their level of reading development.

We assume that if the structure of the proposed iPIPS theoretical model of reading development is confirmed for any two countries compared (i.e. if the test item clusters identified by experts and confirmed by psychometric analysis measure the same construct), this can serve the basis for setting the international benchmarks that will allow comparing cumulative percentages of children at a particular level of reading development across countries. This hypothesis should be tested for other language versions of the iPIPS instrument.

The practical significance of this study is that it introduces educational researchers to the problems that can be encountered when assessing a particular construct (reading skills) on a specific sample of participants (children on school entry) from different countries. The methods used here can be applied to tackle research problems in studies that involve similar constructs and target elementary school students.

In the long term, this methodology can be used both for cross-country comparisons as well as other purposes, such as year-over-year comparison of test results obtained on different samples of students using different versions of the same assessment instrument. In the UK [Bramley 2005], this practice has been implemented for several years to compare scores on some written examinations.

References

Ainley M., Ainley J. (2019) Non-Cognitive Attributes: Measurement and Meaning. *The SAGE Handbook of Comparative Studies in Education* (eds L. E. Suter et al.), London: Sage, pp. 103–125.

American Educational Research Association, American Psychological Association, & National Council on Measurement in Education (AERA, APA, & NCME) (2014) *Standards for Educational and Psychological Testing*. Washington, DC: American Educational Research Association.

Archer E., Howie S. J., Scherman V., Coe R. (2010) Finding the Best Fit: The Adaptation and Translation of the Performance Indicators for Primary Schools for the South African context. *Perspectives in Education*, vol. 28, no 1, pp. 77–88.

Bartholo T. L., Koslinski M. C., Costa M. D., Barcellos T. (2019) *What Do Children Know upon Entry to Pre-School in Rio de Janeiro?* Ensaio: Avaliação e Políticas Públicas em Educação.

Bespalko V. (1989) *Slagaemye pedagogicheskoy tekhnologii* [Components of Pedagogical Technology]. Moscow: Pedagogika.

Bramley T. (2005) A Rank-Ordering Method for Equating Tests by Expert Judgment. *Journal of Applied Measurement*, vol. 6, no 2, pp. 202–223.

Buzhardt J., Greenwood C. R., Hackworth N. J., Jia F., Bennetts S. K., Walker D., Matthews J. M. (2019) Cross-Cultural Exploration of Growth in Expressive Communication of English-Speaking Infants and Toddlers. *Early Childhood Research Quarterly*, vol. 48, 3rd Quarter 2019, pp. 284–294.

Carnoy M., Khavenson T., Loyalka P., Schmidt W. H., Zakharov A. (2016) Revisiting the Relationship between International Assessment Outcomes and Educational Production: Evidence from a Longitudinal PISA-TIMSS Sample. *American Educational Research Journal*, vol. 53, no 4, pp. 1054–1085.

Caro D. H., Cortés D. (2012) Measuring Family Socioeconomic Status: An Illustration Using Data from PIRLS2006. *IERI Monograph Series Issues and Methodologies in Large-Scale Assessments*, no 5, pp. 9–33.

Dubeck M. M., Gove A. (2015) The Early Grade Reading Assessment (EGRA): Its Theoretical Foundation, Purpose, and Limitations. *International Journal of Educational Development*, vol. 40, January, pp. 315–322.

Ercikan K., Roth W. M., Asil M. (2015) Cautions about Inferences from International Assessments: The Case of PISA 2009. *Teachers College Record*, vol. 117, no 1, pp. 1–28.

Espeland W. (2015) Narrating Numbers. *The World of Indicators: The Making of Governmental Knowledge through Quantification*. *Cambridge Studies in Law*

and Society (eds R. Rottenburg, S. Merry, S. Park, J. Mugler), Cambridge: Cambridge University, pp. 56–75.

Esselink B. (2000) *A Practical Guide to Localization. Vol. 4*. Amsterdam, Philadelphia: John Benjamins.

Field A. P. (2014) *Kendall's Coefficient of Concordance* // Wiley StatsRef: Statistics Reference Online.

Goodrich S., Ercikan K. (2019) Measurement Comparability of Reading in English and French Canadian Population: Special Case of the 2011 Progress in International Reading Literacy Study. *Frontiers in Education*, vol. 4. Available at: https://www.frontiersin.org/articles/10.3389/feduc.2019.00120/full (accessed 27 September 2020).

Ivanova A., Kardanova-Biryukova K. (2019) Sozdanie russkoyazychnoy versii mezhdunarodnogo instrumenta otsenivaniya rannikh navykov chteniya [Constructing a Russian-Language Version of the International Early Reading Assessment Tool]. *Voprosy obrazovaniya / Educational Studies Moscow*, no 4, pp. 93–115. DOI: 10.17323/1814–9545–2019–4–93–115

Ivanova A., Kardanova E., Merrell C., Tymms P., Hawker D. (2018) Checking the Possibility of Equating a Mathematics Assessment between Russia, Scotland and England for Children Starting School. *Assessment in Education: Principles, Policy & Practice*, vol. 25, no 2, pp. 141–159.

Kardanova E., Ivanova A., Sergomanov P., Kanonire T., Antipkina I., Kayky D. (2018) Obobshchennye tipy razvitiya pervoklassnikov na vkhode v shkolu. Po materialam issledovaniya iPIPS [Patterns of First-Graders' Development at the Start of Schooling: Cluster Approach Based on the Results of iPIPS Project]. *Voprosy obrazovaniya / Educational Studies Moscow*, no 1, pp. 8–37. DOI: 10.17323/1814–9545–2018–1–8–37

Kreiner S., Christensen K. B. (2014) Analyses of Model Fit and Robustness. A New Look at the PISA Scaling Model Underlying Ranking of Countries According to Reading Literacy. *Psychometrika*, vol. 79, no 2, pp. 210–231.

Leong F. T., Bartram D., Cheung F., Geisinger K. F., Iliescu D. (2016) *The ITC International Handbook of Testing and Assessment*. New York, NY: Oxford University.

Linacre J. M. (2011) *Winsteps Rasch Measurement. Version 3.71. Winsteps. com.*

Linacre J. M. (2006) Rasch Analisis of Rank-Ordered Data. *Journal of Applied Measurement*, vol. 7, no 1, pp. 129–139.

Linacre J. M. (1989) Rank Ordering and Rasch Measurement. *Rasch Measurement Transactions*, vol. 2, no 4, pp. 41–42.

Linacre J. M., Wright B. D. (1994) *A User's Guide to FACETS: Rasch Measurement Computer Program*. Chicago: MESA.

Liu J., Steiner-Khamsi G. (2020) Human Capital Index and the Hidden Penalty for Non-Participation in ILSAs. *International Journal of Educational Development*, vol. 73, iss. C, pp. 1–9.

Masters G. N. (1982) A Rasch Model for Partial Credit Scoring. *Psychometrika*, vol. 47, no 2, pp. 149–174.

Merrell C., Tymms P. (2007) Identifying Reading Problems with Computer-Adaptive Assessments. *Journal of Computer Assisted Learning*, vol. 23, no 1, pp. 27–35.

OECD (2020) *Early Learning and Child Well-Being: A Study of Five-Year-Olds in England, Estonia, and the United States*. Paris: OECD.

Peña E. D. (2007) Lost in Translation: Methodological Considerations in Cross-Cultural Research. *Child Development*, vol. 78, no 4, pp. 1255–1264.

Shuttleworth-Edwards A. B., Kemp R. D., Rust A. L., Muirhead J. G., Hartman N. P., Radloff S. E. (2004) Cross-Cultural Effects on IQ Test Performance: A Review and Preliminary Normative Indications on WAIS-III Test

Performance. *Journal of Clinical and Experimental Neuropsychology*, vol. 26, no 7, pp. 903–920.

Suggate S. P. (2009) School Entry Age and Reading Achievement in the 2006 Programme for International Student Assessment (PISA). *International Journal of Educational Research*, vol. 48, no 3, pp. 151–161.

Thurstone L. L. (1927) A Law of Comparative Judgment. *Psychological Review*, vol. 34, no 4, pp. 273–286.

Tymms P. (1999) Baseline Assessment, Value-Added and the Prediction of Reading. *Journal of Research in Reading*, vol. 22, no 1, pp. 27–36.

Tymms P., Merrell C., Buckley H. (2015) *Children's Development at the Start of School in Scotland and the Progress Made during their First School Year: An Analysis of PIPS Baseline and Follow-Up Assessment Data*. Edinburgh, UK: The Scottish Government. Available at: http://dro.dur.ac.uk/17417/ (accessed 27 September 2020).

Tymms P., Merrell C., Hawker D., Nicholson F. (2014) *Performance Indicators in Primary Schools: A Comparison of Performance on Entry to School and the Progress Made in the First Year in England and Four Other Jurisdictions*. Available at: http://dro.dur.ac.uk/23562/1/23562.pdf (accessed 27 September 2020).

Vidmar M., Niklas F., Schneider W., Hasselhorn M. (2017) On-Entry Assessment of School Competencies and Academic Achievement: A Comparison between Slovenia and Germany. *European Journal of Psychology of Education*, vol. 32, no 2, pp. 311–331.

Wright B. D., Stone M. H. (1979) *Best Test Design*. Chicago, IL: MESA.

Subjective Well-Being of Russian Faculty

An empirical study

L. Klimenko, L. Skachkova

Liudmila Klimenko
Doctor of Sciences in Sociology, Associate Professor, Professor, Higher School of Business, Southern Federal University. Address: 43 23rd Line St, 344006 Rostov-on-Don, Russian Federation.
Email: lucl@yandex.ru

Ljudmila Skachkova
Candidate of Sciences in Economics, Associate Professor, Head of the Department of Human Resource Management, Southern Federal University. Address: 88 Gorkogo St, 344002 Rostov-on-Don, Russian Federation.
Email: lskachkova@gmail.com

Abstract. Drawing upon findings of applied research, this article explores the indicators of subjective well-being (SWB) among faculty of Russia's leading universities. Methodological design of the study discriminates between subjective and objective measures of SWB, examines the affective and cognitive components of well-being, makes allowance for sets of SWB determinants when analyzing the occupational factors, and uses time-tested scales for better measurement validity. Using empirical data, we demonstrate the priority of interesting work, freedom and fulfillment over income in the sample of faculty members. Correlations are found between SWB and the age and qualifications of teaching faculty. A negative impact of modern education reforms on occupational well-being of faculty is observed. Along with faculty retention and motivation strategies, universities should develop and implement employee well-being initiatives.

Keywords: subjective well-being, faculty, happiness, hedonism, eudaimonism, life quality, occupational well-being.

Academic careers, on the one hand, may be unattractive due to relatively low salaries, excessive paperwork and administrative reporting, job cuts, and high levels of psycho-emotional stress. On the other hand, academia remains a relatively closed and self-sufficient system, as evidenced by the high level of inbreeding and low staff turnover in Russian universities. [Mikhalkina, Skachkova 2018]. What keeps faculty members in their jobs? Obviously, it cannot be pragmatic considerations alone. There must be those who feel that they belong in this profession, which is an important argument to start examining the factors of subjective well-being of academic personnel. Hopefully, this will explain the paradoxical attractiveness of jobs in academia for many—but not all—faculty members.

Furthermore, the new development strategies of Russian universities require that faculty members should be fully involved in implementing the university development programs. Working in academia is not limited to teaching and the normal working hours. Of course, employees under such conditions need stronger incentives and a more responsive attitude from the administration. One more question is therefore raised: what should be done to stimulate genuine involvement of the faculty in university development? The idea of studying the indicators, components and group-specific aspects of faculty subjective well-being thus becomes important for designing employee motivation programs as well.

1. Subjective Well-Being: Approaches and Measurement

Subjective well-being (SWB) is topical in economics, positive psychology, medicine, sociology, and other sciences. The first studies on SWB in academia and other spheres of life appeared in the 1960s [Diener 1984]. Today, a new interdisciplinary domain of research is emerging: science of well-being [Alexandrova 2017]. Institutionalization of this field of study was also marked by establishing the *Journal of Happiness Studies*, which publishes findings of theoretical and empirical research on SWB. The present-day scientific discourse features three important aspects associated with well-being research strategies: (1) defining the conceptual framework; (2) applying objective and/or subjective measures; (3) identifying the structural components and determinants of SWB.

In research literature, the concept of SWB is most commonly and fairly consistently associated with that of happiness[1]. In 1974, Richard A. Easterlin found the rate of human welfare enhancement to be almost independent of the rate of national income growth [Easterlin 1974]. This phenomenon was named "the Easterlin paradox". Later on, it was revealed that the impact of monetary saturation on life satisfaction started decreasing beyond a certain threshold [Inglehart, Welzel 2010]. It became obvious that life quality and well-being could not be measured using the objective metrics alone[2]. Furthermore, the subjective approach works best for self-reported well-being [Khashchen-

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[1] In this article, subjective well-being is also treated as synonymous to happiness.

[2] There are now a lot of indices to assess and quantify well-being: the Happy Planet Index, the Gallup-Healthways Well-Being Index, the OECD Better Life Index, the UN's Human Development Index, various indices of subjective economic well-being, etc. Those indices measure both objective and subjective parameters of well-being. For example, different countries use large arrays of objective statistical data on income, health and life expectancy, i. e. objective measures of well-being. The Happy Planet Index combines subjective life satisfaction (based on sociological surveys) as well as objective measures such as life expectancy at birth and ecological footprint per capita.

ko 2011]. Therefore, a new subjective metric of individual quality of life emerges to measure the factors that make people feel good in every aspect of their life [Angner 2010].

Most often, researchers discriminate between the affective (momentary affective states) and cognitive (judgments about happiness) components of SWB. The affective component is described as emotional responses to the current events in life that can be positive as well as negative [Diener 1984], as emotional experiences related to past, present or future [Seligman 2002], as mental state at the moment [Parfit 1984], as affective responses to positive and negative events or situations [Andrews, Withey 1974], or as emotional quality of an individual's everyday experience—joy, sadness, anger, etc. [Kahneman, Deaton 2010]. Meanwhile, SWB does not imply an absence of negative emotions but a balance between negative and positive affect [Bradburn 1969].

The cognitive component of SWB implies, first of all, comparison with the socially accepted, culture-specific standard of a happy life as well as assessment of one's quality of life according to one's own chosen criteria [Diener 1984]. Researchers analyze how people perceive their lives in general and focus on the associations among emotional state, perceived life quality, demographic and other variables (religion, leisure, marital status, health, etc.) [Kahneman, Deaton 2010]. Two levels of cognitive evaluation of SWB are identified: satisfaction of one's own preferences (accounts of desire-satisfaction) and compliance with some universally accepted criteria (objective-list accounts) which are believed to be unquestionable indicators of happiness (e. g. starting a family and being a good parent, meeting the moral standards and orientations, developing one's skills, etc.) [Parfit 1984].

Another important distinction is between "hedonic" (enjoyment of life) and "eudaimonic" (meaning, fulfillment, and commitment to socially shared values) happiness [Kainulainen, Saari, Veenhoven 2018]. These two components are combined in the concepts of "happiness minimum" and "happiness maximum" [Leontyev 2020]. "Happiness minimum" is achieved by the quality of life that allows satisfaction of the most basic needs, so it can be reached by improving one's economic well-being. However, other factors come into play beyond a certain minimum level of happiness, a conventional point of monetary saturation. The maximum level of happiness is achieved through individual strategies and purposes, and that is where joy can be experienced.

The determinants of SWB have been established empirically. Religion is a significant factor: involvement in the life of a parish community correlates positively with life satisfaction [Melkumyan 2020]. Arguments have been provided to support the hypothesis of sociocultural impacts in explaining SWB, which states that perceived happiness depends not only (and not so much) on the current living conditions but also on social norms, traditions, and the fundamental worldviews

shared across generations [Andreenkova 2020]. A number of studies have shown that people in countries with an individualist culture have higher levels of happiness than those in a collectivist culture [Antipina 2017; Ye, Ng, Lian 2015]. There are also intergenerational differences in happiness: the older generation enjoys much higher levels of SWB than Generations Y and Z, the latter being much more often dissatisfied with their social status and embittered by their expectations from life never coming true [Sibirev, Golovin 2020].

Enjoyment of work, or job satisfaction, is another variable of SWB [Sousa-Poza, Sousa-Poza 2000; Georgellis, Lange 2012]. A positive relationship between job satisfaction and SWB has been reported in Russian literature, the effect differing across social groups [Soboleva 2020]. Employees with higher levels of identity and loyalty to their work organization demonstrate improved productivity even when monetary incentives are weak. Otherwise speaking, identity and monetary incentives are substitutes [Akerlof, Kranton 2005].

There are few studies examining SBW in specific occupational groups. SWB of physicians and nurses in Chinese hospitals was found to be higher when there was a collaborative relationship among employees in an organization [Fan et al. 2014]. Positive professional identity is a critical factor of life satisfaction for social workers in Canada [Graham, Shier 2010]. Affect is the most central dimension in the structure of Dutch teachers' SWB [Horn et al. 2004]. Implementing a culture of support increased the level of SWB among employees of public institutions of higher education in Portugal [Santos, Gonçalves, Gomes 2013]. In Russia, it is mostly social psychologists who analyze SWB in specific occupational groups, such as the students and professors of South Ural State University's Faculty of Journalism [Yashchenko 2012], the teaching staff of vocational schools in Samara Oblast [Vinogradova 2010], helping professionals (teachers, psychologists and social workers) in Orenburg Oblast [Molokostova, Yakimanskaya 2015], etc.

The literature analyzed provides a conceptual and methodological framework for studying SWB of faculty members in modern universities. Furthermore, the positive correlation between job satisfaction and labor productivity revealed in a number of studies allows for an assumption that assessment of faculty SWB may be helpful in designing effective tools for faculty performance management and for a more successful implementation of modern university development strategies.

2. Hypotheses, Methodology, and Empirical Basis of Research

The aim of this study is to analyze the structural components, group-specific characteristics and determinants of SWB among faculty members. Based on the review of available literature, the following hypotheses were formulated: (1) interesting work, freedom and fulfillment are prioritized over income in the hierarchy of personal core values of faculty as an occupational group; (2) SWB is contingent on the

Table 1. **Empirical indicators of faculty SWB**

Affective component	
• Balance of negative and positive affect • Perceived happiness	
Cognitive component	
Value and meaning orientations	• Personal core values • Sense of agency in one's life strategies • Perceived freedom
Perceived life quality	• Economic well-being (housing, clothing, nutrition, income) • Opportunity for refreshment (recreation, leisure, time with friends) • Private sphere (family, health, personal safety)
Occupational well-being	• Status of the profession • Job satisfaction • Career risks

age and qualifications of teaching faculty[3]; 3) in the context of labor precarization, the modern reforms in Russian education have negative effects on faculty SWB.

The methodology of assessing SWB of Russian faculty is based on (1) discriminating between the subjective and objective dimensions of well-being; (2) identifying two major components of SWB, affective (the balance of negative and positive emotions at the moment; momentary happiness) and cognitive (judgments of SWB); (3) making allowance for sets of SWB determinants when analyzing the occupational factors (Table 1); and (4) using time-tested measurement methods and scales: Bradburn's Scale of Psychological Well-Being (the Affect Balance Scale), Cantril's Self-Anchoring Striving Scale (the Cantril Ladder), and the Teacher Job Satisfaction Scale used in the Teaching and Learning International Survey (TALIS). Additionally, the sociological toolkit included items from the European Social Survey[4] (perceived happiness and life values) and the Russian Public Opinion Research Center's Index of Social Moods[5] (self-reported financial situation). The use of standardized scales allows comparing the results of assessing different aspects of SWB in a sample of faculty mem-

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[3] The focus of analysis on the SWB indicators of faculty subgroups differing in age and qualifications is explained by the young talent attraction and retention policy in higher education as well as the search for effective ways of motivating and involving various groups of faculty in university strategy implementation.

[4] ESS-2019: http://www.ess-ru.ru

[5] WCIOM (2019) *Social Well-being of Russians: A Monitoring Study*. Press release No. 3979. Available at: https://wciom.ru/index.php?id=236&uid=9746

bers to those obtained for teachers and Russian population in general, thus improving the accuracy of interpretations. Findings from a variety of studies are used because none of them contains all the aspects of well-being that we would like to compare.

Results of a standardized online survey of faculty members in Russian federal universities were used as empirical basis of research. The 2019 survey involved 356 employees in ten universities[6], male respondents accounting for 32% of the sample. The percentage of respondents aged 25–34 was 21%, those aged 35–44 accounted for 29%, 45–54 for 18%, 55–64 for 21%, and those above 64, for 11%. The profile of the respondents in terms of position and academic degree is given in Appendix 1.

3. Affective Component of Subjective Well-Being

Score calculation using Norman M. Bradburn's Affect Balance Scale (ABS) [Bradburn 1969]) involves the following: (1) the Positive Affect Scale value is estimated as the number of positive answers to five questions associated with positive emotions; (2) the Negative Affect Scale value is estimated based on the answers to five other questions[7]; 3) the difference between the positive and negative affect reflects the affect balance, which can take values from –5 to 5.

Bradburn's methodology is designed for measuring emotions experienced in the recent past. Item formulations prevent focusing on any specific events to avoid reflection. Validity of Bradburn's scale was confirmed in an assessment of emotional well-being across 40 nations [Diener, Suh 1999] and tested on a sample of Russian scientists [Troshikhina, Manukyan 2017].

In most faculty members, positive emotions prevailed over negative ones (ABS scores from 1 to 5 for 76% of the respondents). However, most respondents scored low on the ABS (1–3 scores, 64%). The percentage of positive ABS values increases from the subgroup of people aged 25–34 to those aged 35–44 (70 and 80%, respectively), drops noticeably in the subgroup of those aged 45–54 (67%), and then increases again between the age of 55–64 to the oldest generation (75 and 95%, respectively). The share of respondents scoring 3 to 5 or higher on the ABS is greater among Doctors of Sciences compared to Candidates of Sciences and non-degreed faculty members (42% compared to 30 and 29%, respectively)[8] (Table 2).

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[6] Immanuel Kant Baltic Federal University (8%), Far Eastern Federal University (15%), Kazan Federal University (6%), V. I. Vernadsky Crimean Federal University (4%), Northern Arctic Federal University (17%), Ammosov North-Eastern Federal University (7%), North-Caucasus Federal University (11%), Siberian Federal University (8%), Southern Federal University (16%), Ural Federal University (8%).

[7] See Appendix 2 for a complete list of questions.

[8] In the subgroup of faculty members aged 25–34, 56% had no academic degree and 44% were Candidates of Sciences; among those aged 35–44, 77%

Table 2. **The affective component of faculty SWB measured on the ABS**, %

Emotional well-being index (ABS=PAS-NAS)	Mean ABS in the sample	ABS by age subgroups					ABS by academic degree subgroups		
		25–34	35–44	45–54	55–64	> 64	No degree	Candidate of Sciences	Doctor of Sciences
5	3	–	6	–	6	–	2	5	–
4	9	6	8	15	9	11	9	7	**16**
3	**20**	19	24	11	21	21	**18**	**18**	**26**
2	**25**	31	20	37	18	26	**28**	**28**	17
1	**19**	14	22	4	21	37	**18**	**19**	**19**
0	**12**	19	10	11	15	–	13	13	9
−1	6	3	4	15	6	5	8	5	7
−2	2	3	2	4	3	–	–	3	4
−3	1	3	–	–	–	–	–	1	1
−4	2	3	2	4	–	–	1	1	1
−5	1	–	2	–	–	–	3	–	–

Table 3. **Taking all things together, how happy would you say you are? (scale from 0 to 10, where 0 is "extremely unhappy" and 10 is "extremely happy"), mean scores**

Russia, ESS9 (2018–2019)	Faculty members of Russian federal universities, 2019								
		Age					Academic degree		
	Mean	25–34	35–44	45–54	55–64	> 64	No degree	Candidate of Sciences	Doctor of Sciences
6.5	7.0	7.2	**6.6**	6.7	**7.5**	6.9	**6.4**	7.0	**7.3**

Bradburn revealed a strong positive correlation between SWB (happiness) and the ABS score. In this study, changes in faculty's perceived happiness were measured using the European Social Survey (ESS) scale. A comparison between measurements shows that the teaching staff of Russian federal universities is on average happier than the national average. In the 9th round of the ESS, Russia's

were Candidates of Sciences, 10% were Doctors of Sciences, and the rest had no academic degree; among those aged 45–54, 61% were Candidates of Sciences and 19% were Doctors of Sciences; among those aged 55–64, 51% were Candidates of Sciences and 46% were Doctors of Sciences; among those aged 65+, 40% were Candidates of Sciences and 45% were Doctors of Sciences.

average score was 6.5 out of 10[9] (one of the lowest among all the 23 participating countries and virtually unchanged since 2012), compared to 7 among the teaching faculty (which is close to the results of many Western European countries)[10]. Among the subgroups, the highest level of happiness was observed among Doctors of Sciences and the respondents aged 55–64 (Table 3).

Correlations between the values on the integrative scale measuring happiness, on the one hand, and the variables "Age" and "Academic degree", on the other, are statistically significant[11].

4. The Cognitive Component of SWB

Research on the SWB of Russian teaching faculty also involved analysis of value and meaning orientations, perceived life quality, and job satisfaction.

4.1. Value and meaning orientations

The values ranked by the respondents as the most important included having found one's vocation (the cumulative percentage for the first two response options = 86%), getting respect from others (79%), making one's own decisions about what one does (76%), showing one's abilities (68%), and being creative (60%). Building a career (41%) and being rich (25%) were ranked next to the last among personal core values, and having an influence on politics (18%) mattered the least (Table 4). At the level of Russian population, the significance of thinking up new ideas and being creative is 39%, showing one's abilities-37%, and getting respect from others-49% (ESS9).

The data obtained is aligned with the results of focus groups involving faculty members from five universities in the South of Russia, of which three were federal, which showed that income as a measure of economic well-being was valued less by faculty than freedom of choice and interesting work [Skachkova, Shchetinina, Kryachko 2018].

Most faculty members are oriented toward the sense of agency in their life strategies, 63% of the respondents being convinced that success in life depends on their own effort. Such orientations are most likely to be found among respondents aged 35–54. In addition, the level of agency increases from non-degreed faculty members to Doctors of Sciences (Table 5). According to the World Values Survey, people in economically advanced societies with strong democratic institutions are very likely to feel that they have control over the way their life turns out [Inglehart, Welzel 2005].

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[9] ESS-2019: http://www.ess-ru.ru

[10] In 2018–2019, the ESS score was 7.4 in France, 7.1 in Italy, 7.7 in Spain, 7.8 in Germany, 7.1 in Czech Republic, and 7.3 in Estonia.

[11] The correlation between "Happiness" and "Age" is characterized by Pearson's chi-square of 71.865 (p=0.001), Cramér's V of 0.227 (p=0.001) and the Phi coefficient of 0.453 (p=0.001). The correlation between "Happiness" and "Academic degree" is also strong enough, with Pearson's chi-square of 46.507 (p=0.001), Cramér's V of 0.258 (p=0.001), and the Phi of 0.365 (p=0.001).

Table 4. **Please indicate how much each description is or is not like you**, %

	Very much like me	Like me	Somewhat like me	A little like me	Not like me	Not like me at all	Don't know
Thinking up new ideas and being creative is important to him/her	**30**	31	23	8	7	1	1
It is important to him/her to be rich	5	20	**24**	14	**28**	8	1
It's important to him/her to show his/her abilities	**26**	**42**	14	7	7	2	-
It is important to him/her to build a career	11	**30**	**25**	10	18	5	1
It is important to him/her to make his/her own decisions about what he/she does	**39**	**37**	13	6	3	1	1
It is important to him/her to get respect from others	**48**	**32**	11	5	3	2	1
It is important to him/her to find his/her vocation and place in life	**53**	**33**	8	3	2	1	1
It is important to him/her to have an influence on politics	6	12	17	15	**27**	**23**	1

Table 5. **Do you think success in life depends more on your own effort or the circumstances beyond your control?**, %

	Mean	Age					Academic degree		
		25–34	35–44	45–54	55–64	>64	No degree	Candidate of Sciences	Doctor of Sciences
My own effort	63	54	71	61	56	54	57	61	72
Circumstances beyond my control	22	22	19	19	25	22	16	23	22
Don't know	16	24	10	19	19	24	27	16	6

Degree of freedom is rated lower than happiness, on average 6.3 on a ten-point scale. Having found one's place in life was rated on average 7.3 out of 10. The two variables demonstrate higher values among faculty members with academic degrees and those aged 54 or older (Figure 1).
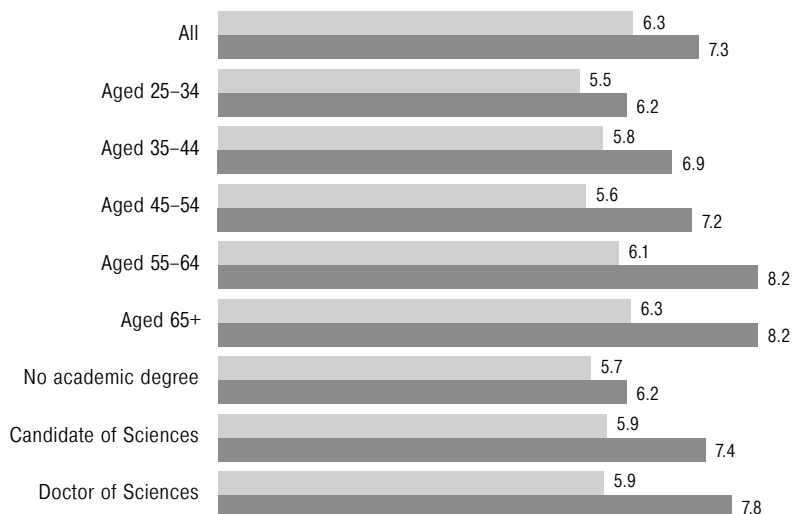
4.2. Perceived life quality Economic well-being was assessed using the scale and index methodology of the nationwide surveys administered by Russian Public Opinion Research Center (WCIOM)[12]. Faculty members were found to

[12] The index is obtained by adding the positive and neutral scores ("Very good/Good" and "Average") and finding the difference between the sum and the negative scores ("Bad/Very bad").

Figure 1.

■ **To what extent would you say you feel independent?** (scale from 0 to 10, where 0 is "extremely dependent" and 10 is "extremely independent"), mean scores

■ **To what extent would you agree or disagree with the following: "I have found my vocation and my place in life"** (scale from 0 to 10, where 0 is "strongly disagree" and 10 is "strongly agree"), mean scores

	Independent	Vocation
All	6.3	7.3
Aged 25–34	5.5	6.2
Aged 35–44	5.8	6.9
Aged 45–54	5.6	7.2
Aged 55–64	6.1	8.2
Aged 65+	6.3	8.2
No academic degree	5.7	6.2
Candidate of Sciences	5.9	7.4
Doctor of Sciences	5.9	7.8

rate their financial situation above the national average (80 vs 50). The highest indices were obtained for respondents aged 55–64 and Doctors of Sciences, and the lowest for those aged 25–34 and 64+ as well as non-degreed teachers (Table 6).

Respondents are satisfied with their family relationships, nutrition, what they wear and where they live. Financial situation and opportunities for leisure and recreation were found to be the least satisfying of all parameters. The highest level of satisfaction in different domains of life is observed among faculty members aged 55–64, and the lowest one among those aged 25–34. The lowest levels of financial and leisure satisfaction were shown in the group of non-degreed respondents, and the lowest level of health satisfaction was demonstrated by Doctors of Sciences (Table 7). Therefore, most faculty members are not satisfied with their financial situation, describing it as average.

As respondents report, their level of income does not allow them to satisfy their basic needs of freedom and independence, economic well-being, fulfillment and personal safety (none of these parameters was given more than 5.9 scores out of 10 across the sample). The level of satisfaction is somewhat higher among respondents aged 55–64 and somewhat lower among those aged 35–44 (Table 8). About one

Table 6. **How would you describe your current financial situation?**, %

	Faculty members of federal universities, 2019									Russia, 2019*
	Mean	Age					Academic degree			
		25–34	35–44	45–54	55–64	>64	No degree	Candidate of Sciences	Doctor of Sciences	
Very good / Good	27	32	26	13	**32**	**32**	14	29	**36**	14
Average	**63**	49	67	71	66	49	60	64	61	**61**
Bad / Very bad	10	19	8	13	3	**19**	24	7	3	**25**
Don't know	1	0	0	3	0	0	3	0	0	0
Index	80	62	84	71	94	62	49	86	94	50

* WCIOM (2019) *Social Well-Being of Russians: A Monitoring Study*. Press release No. 3979.
Available at: https://wciom.ru/index.php?id=236&uid=9746

Table 7. **How satisfied are you with the following domains of your life?** (scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied"), mean scores

		Age					Academic degree		
	Mean	25–34	35–44	45–54	55–64	>64	No degree	Candidate of Sciences	Doctor of Sciences
Family relationships	**8.1**	**8.0**	7.5	**8.4**	**8.4**	8.5	**7.9**	**8.1**	**8.2**
Nutrition	**7.9**	**7.4**	7.6	**8.0**	**8.7**	7.7	6.9	**8.2**	**8.1**
Clothing and footwear	**7.4**	6.7	7.4	7.3	**7.9**	7.4	6.2	**7.6**	**7.7**
Living conditions	**7.1**	5.8	7.4	5.9	**8.0**	8.5	5.9	7.2	**7.9**
Place, region of residence	7.0	6.4	7.1	6.7	**7.6**	6.9	5.9	**7.4**	6.9
Social status	7.0	6.3	7.1	6.4	**7.8**	7.6	5.8	**7.3**	**7.3**
Personal safety	6.9	6.8	6.8	6.5	**7.3**	6.9	6.4	**7.1**	6.7
Socializing with friends	6.8	6.9	6.5	6.7	**7.2**	6.9	6.8	6.9	6.7
Recreation opportunities	6.3	5.9	6.1	6.3	6.8	6.7	5.6	6.6	6.4
Health	6.3	6.5	6.1	6.2	6.4	6.5	6.3	6.5	**5.8**
Leisure opportunities	5.8	5.2	5.7	6.0	6.3	5.9	**4.9**	6.1	6.1
Financial situation	5.8	5.4	5.9	5.0	6.5	5.9	**4.3**	6.0	6.5

Table 8. **To what extent would you say your income satisfies the following needs?** (scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied"), mean scores

	Mean	Age					Academic degree		
		25–34	35–44	45–54	55–64	>64	No degree	Candidate of Sciences	Doctor of Sciences
Independence and freedom	5.7	5.9	5.7	5.0	**6.0**	**6.0**	4.8	5.9	6.0
Economic well-being	5.4	5.3	5.5	4.6	**6.1**	5.5	4.3	5.6	5.9
Fulfillment	5.6	5.5	5.4	4.8	**6.2**	**6.2**	4.5	5.8	6.2
Personal safety	5.9	5.9	5.6	5.2	**6.4**	**6.2**	5.2	6.0	5.9

third of faculty members in federal universities (34%) believe their salaries to be below the regional average, 31% perceiving their level of pay as just about the regional average, and only 28% thinking that their salaries are above the regional average.

4.3. Job satisfaction

Findings from focus groups with faculty members indicate that job-related factors play a significant role as determinants of SWB among the teaching faculty [Skachkova, Shchetinina, Kryachko 2018].

Job satisfaction was assessed using an adaptation of the TALIS scale[13]. Faculty members agree that the advantages of their profession outweigh the downsides with an average score of 6.5 on a ten-point scale. Satisfaction with career advancement opportunities in the workplace is lower, being the highest among teachers aged 55–64 and those with academic degrees. Loyalty to university is moderate, with the average score of 6 out of 10 for willingness to change the institution, higher levels of commitment among respondents aged 45–54 and 65+ and lower levels among non-degreed faculty members (Table 9).

Getting respect from colleagues and students is rated on average 7.8 out of 10 and never goes below 8.3 in the older age subgroups. Having an opportunity to think up new ideas and be creative (7.5) and show their abilities (7.5) is what faculty members value the most in their job. These parameters were rated the highest in the subgroups of respondents aged 54 and older as well as teachers with academic degrees (from 7.9 to 8.2). Ability to make one's own decisions about what one does received a lower rating (6.3), the oldest age subgroup

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[13] National Research University Higher School of Economics, Federal Institute for Evaluation of Education Quality (2015) Report on the Works Completed (Services Provided) under Public Contract No. F-25-ks-2015 "Analysis of the Results of the Teaching and Learning International Survey in the Russian Federation (TALIS-2013) of November 30, 2015.
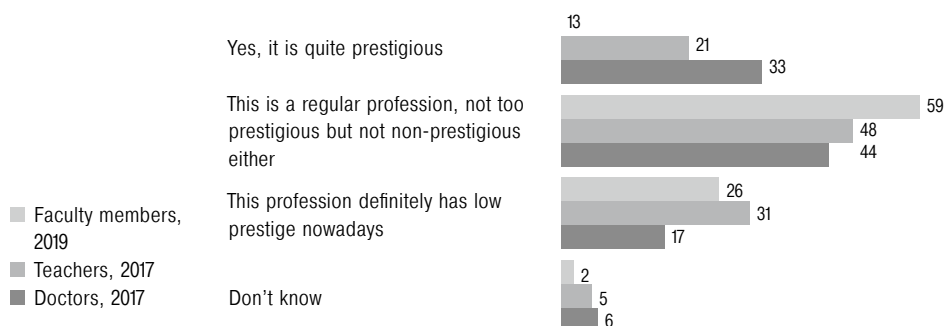
Table 9. **To what extent would you agree with the following?** (scale from 0 to 10, where 0 is "strongly disagree" and 10 is "strongly agree"), mean scores

	Mean	Age					Academic degree		
		25–34	35–44	45–54	55–64	>64	No degree	Candidate of Sciences	Doctor of Sciences
The benefits of my profession clearly outweigh the downsides	6.5	6.2	6.6	5.8	**6.8**	**7.0**	5.4	**6.8**	**6.7**
I am satisfied with the career advancement opportunities in my current place of work	5.6	5.3	5.6	5.0	**6.5**	5.5	4.3	**5.9**	**6.0**
I would prefer changing the university if an opportunity came up	6.0	6.5	6.3	**5.1**	6.8	**4.7**	6.8	5.8	6.0
I get respect from my colleagues and students	**7.8**	7.3	7.6	7.8	**8.5**	**8.3**	7.6	7.9	7.9
My profession allows me to think up new ideas and be creative	**7.5**	7.0	7.2	7.4	**7.9**	8.2	7.0	**7.6**	**7.5**
My job allows me to show my abilities	**7.5**	7.3	7.2	7.0	**8.2**	7.9	6.6	**7.7**	**7.7**
My job allows me to make my own decisions about what I do	**6.3**	6.2	6.3	6.3	**6.6**	5.9	5.6	**6.5**	**6.6**
The government is effective at solving the socioeconomic problems of academic personnel	**3.7**	4.0	3.8	3.4	**3.9**	2.9	3.1	**4.1**	**3.5**
All things considered, I am satisfied with my job	**7.0**	6.4	7.1	6.6	**7.8**	7.2	5.8	**7.3**	**7.4**

being the most critical about it. Faculty members do not agree that the government is effective at solving the socioeconomic problems of academic personnel—this parameter did not receive more than 4 scores in any subgroup. Nevertheless, the majority of respondents are satisfied with their job, all things considered (7 scores on average, the highest values being observed in the subgroup of those aged 55–64) (Table 9).

Faculty members of federal universities do not consider their profession as highly prestigious. Only one tenth of the respondents regard working in academia as definitely prestigious, while a quarter of them perceive their occupation as non-prestigious, the majority keeping neutral. At the same time, teachers in higher education are rath-

Figure 2. **Do you think the academic/teaching/medical profession is prestigious?**, %

Legend:
- Faculty members, 2019
- Teachers, 2017
- Doctors, 2017

Yes, it is quite prestigious
- 13
- 21
- 33

This is a regular profession, not too prestigious but not non-prestigious either
- 59
- 48
- 44

This profession definitely has low prestige nowadays
- 26
- 31
- 17

Don't know
- 2
- 5
- 6

er satisfied with their social status. A comparison between the results of this study and job satisfaction self-reports obtained from teachers and physicians [Klimenko et al. 2018] shows that physicians perceive their profession as more prestigious than teachers, while teachers are more likely than other professional groups to be critical in their assessments (Figure 2).

Among the factors of loyalty to academia, the most significant ones are enjoyment in teaching and doing research (75%), flexible working hours (65%), engagement with young, interesting and creative people (65%), knowledge transfer (44%), and long vacations (37%). As for the factors of withdrawal, the most frequently mentioned ones include the ever growing amount of paperwork and administrative reports (75%), the ongoing job cuts in higher education (66%), low salaries for academic staff (61%), working outside the normal working hours (evenings, nights, weekends and vacations) (57%), and low involvement of students in learning (31%).

Reformation of public (educational, healthcare) institutions in Russia is fraught with bureaucratization, orientation toward formalized performance indicators, unstable professional trajectories, and precarization of academic labor [Volchik, Klimenko, Posukhova 2018]. The findings of this study indicate that 83% of federal university teachers are concerned about the risks of increased workload and no raise. Over 60% of the respondents worry about losing their job and/or having to work part-time (Figure 3). Data obtained from teachers and physicians employed in public institutions also reveals a high level of concerns about the increasing workload and risks of losing the job (from 62 to 84%) [Volchik, Klimenko, Posukhova 2018; Klimenko, Posukhova 2018]. In other words, a significant level of anxiety caused by employment and income insecurity and uncertainty about the future is observed among faculty members just as among other public sector employees.

Figure 3. **How concerned are you about
the following nowadays?**, %

Losing the job
Increased
workload, no raise
Having to work
part-time
Pay cuts or delays
in payment

	Highly concerned	Rather concerned	Rather unconcerned	Unconcerned
Losing the job	37	28	25	10
Increased workload, no raise	55	28	12	5
Having to work part-time	34	29	24	12
Pay cuts or delays in payment	25	32	26	17
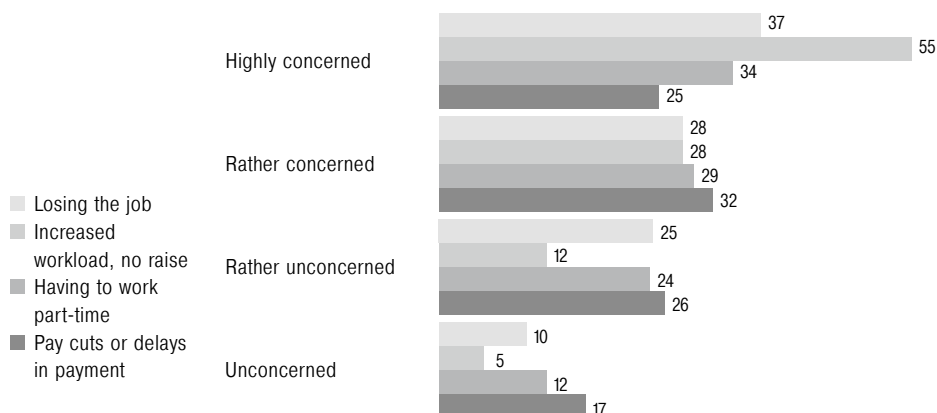
Overall life satisfaction was measured using Cantril's Self-Anchoring Striving Scale. The average level of life satisfaction among faculty members is relatively low: 6.6 scores. However, this is still slightly higher than Russia's national score of 5.8 in the latest round of ESS. In Western European countries, this index varies between 6.2 and 8.2[14].

The coefficients of correlation between the Cantril Ladder value and the variables "Age" and "Academic degree" indicate a statistically significant relationship between life satisfaction and the age and qualifications of faculty members.[15] The highest level of life satisfaction is observed among the respondents aged 45–64 and those with academic degrees (Table 10).

Analysis of ESS findings from previous years shows that levels of happiness in European countries are on average higher than those of life satisfaction [Khavenson, Orel 2014]. In 2018, according to ESS data, happiness was slightly higher than life satisfaction in Russia, too (6.5 vs 5.8, respectively). In the present study of faculty SWB, the values on these two scales are virtually identical (6.5 and 6.6), which indicates, along with the other indicators described, a more balanced ratio of the affective and cognitive components of SWB among faculty members.

[14] ESS9 (2019): http://www.ess-ru.ru
[15] The calculated coefficients have high confidence intervals. For the correlation between "Life satisfaction" and "Age", Pearson's chi-square is 75.368 ($p = 0.001$), Cramér's V is 0.233 ($p = 0.001$), and Phi is 0.465 ($p = 0.001$). For the correlation between "Life satisfaction" and "Academic degree", Pearson's chi-square is 51.672 ($p = 0.000$), Cramér's V is 0.272 ($p = 0.000$), and Phi is 0.385 ($p=0.000$).

Table 10. **All things considered, how satisfied are you with your life as a whole nowadays? (scale from 0 to 10, where 0 is "extremely dissatisfied" and 10 is "extremely satisfied"), mean scores**

Russia, ESS9 (2018–2019)	Faculty members of federal universities, 2019								
		Age					Academic degree		
	Mean	25–34	35–44	45–54	55–64	> 64	No degree	Candidate of Sciences	Doctor of Sciences
5.8	6.6	6.7	6.8	7.4	7.0	6.1	6.1	7.0	7.3

5. Conclusion   Factors of SWB among faculty members were analyzed with a view to find effective means of employee retention and motivation in higher education. The findings obtained allow for the following inferences:

1. At the level of the affective component, the occupational group of faculty members demonstrate, along with a contextual "surplus" of positive affect, higher levels of happiness and life satisfaction compared to Russia's national average. At the level of the cognitive component, however, the respondents gave quite critical assessments of their financial situation (although better than the national average), working conditions and prestige of the profession. Meanwhile, income was found to be valued less than interesting work, fulfillment, creativity, and recognition. Obviously, being part of the academic profession is what makes this occupational group subjectively happier.

2. The study confirms the hypothesis that SWB is contingent on the age and qualifications of faculty members, being on average higher in older age subgroups (54+) and highly qualified respondents (Doctors of Sciences). The lowest levels of satisfaction among loyal faculty members were observed for young employees and those with no academic degree.

3. Modern education reforms may have negative effects on occupational well-being of faculty members, as transformations are fraught with increased workload, a growing amount of administrative reporting, job cuts, and the introduction of part-time contracts and employee ranking systems. Findings reveal a significant level of anxiety among faculty members caused by employment and income insecurity and uncertainty about the future.

In the recent years, faculty members have been required to be fully involved in implementing the university's key development strategies, which implies engagement in activities untypical of the traditional academia. In this situation, employee motivation strategies should become more elaborated and extend beyond administrative and financial incentives. A more extensive motivation system should involve effective social responsibility towards the academic staff, including the de-

velopment and implementation of employee well-being initiatives[16]. Then, perhaps, it will be possible to start moving from the "happiness minimum" to the "happiness maximum".

References

Akerlof G., Kranton R. (2005) Identity and the Economics of Organizations. *Journal of Economic Perspectives*, vol. 19, no 1, pp. 9–32.

Alexandrova A. (2017) *A Philosophy for the Science of Well-Being*. Oxford: Oxford University.

Andreenkova A. (2020) Mezhstranovye razlichiya v urovne schastya v postsovetskikh stranakh—sravnitelny analiz [Cross-National Differences in Level of Happiness in the Post-Soviet Countries: A Comparative Analysis]. *Monitoring of Public Opinion: Economic and Social Changes*, no 1, pp. 316–339.

Andrews F. M., Withey S. B. (1976) *Social Indicators of Well-Being: America's Perception of Life Quality*. New York: Plenum.

Andrews F. M., Withey S. B. (1974) Developing Measures of Perceived Life Quality: Results from Several National Surveys. *Social Indicators Research*, vol. 1, no 1, pp. 1–26.

Angner E. (2010) Subjective Well-Being. *The Journal of Socio-Economics*, vol. 39, no 3, pp. 361–368.

Antipina O. (2017) Ekonomika, kultura i schastye: est li vzaimosvyaz? [Economy, Culture and Happiness: Is There Interconnection?]. *Mirovaya Ekonomika i Mezhdunarodnye Otnosheniya / World Economy and International Relations*, vol. 61, no 7, pp. 35–44.

Bradburn N. M. (1969) *The Structure of Psychological Well-Being*. Chicago: Aldine.

Cantril H. (1965) *The Pattern of Human Concerns*. New Brunswick, NJ: Rutgers University.

Diener E. (1984) Subjective Well-Being. *Psychological Bulletin*, vol. 95, no 3, pp. 542–575.

Diener E., Suh E. M. (1999) National Differences in Subjective Well-Being. *Well-Being. The Foundations of Hedonic Psychology* (eds D. Kahneman, E. Diener, N. Schwarz), New York: Russell Sage, pp. 434–450.

Easterlin R. E. (1974) Does Economic Growth Improve the Human Lot? Some Empirical Evidence. *Nations and Households in Economic Growth: Essays in Honor of Moses Abramovitz* (eds P. A. David, M. W. Reder), New York: Academic Press, pp. 89–125.

Fan D., Cui L., Zhang M.M, Zhu C. J., Härtel C. E.J., Nyland C. (2014) Influence of High Performance Work Systems on Employee Subjective Well-Being and Job Burnout: Empirical Evidence from the Chinese Healthcare Sector. *The International Journal of Human Resource Management*, vol. 25, no 7, pp. 931–950.

Georgellis Y., Lange T. (2012) Traditional vs. Secular Values and the Job—Life Satisfaction Relationship across Europe. *British Journal of Management*, vol. 23, no 4, pp. 437–454.

Graham J., Shier M. (2010) Social Work Practitioners and Subjective Well-Being: Personal Factors that Contribute to High Levels of Subjective Well-Being. *International Social Work*, vol. 53, iss. 6, pp. 757–772.

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[16] For instance, the University of Cambridge has been implementing its Well-Being Strategy for a few years now: https://www.well-being.admin.cam.ac.uk/files/report.pdf

Horn J. E.V., Taris T. W., Schaufeli W. B., Schreus P. J.G. (2004) The Structure of Occupational Well-being: A Study among Dutch Teachers. *Journal of Occupational and Organizational Psychology*, vol. 77, no 3, pp. 365–375.

Inglehart R. F., Welzel C. (2010) Agency, Values, and Well-Being: A Human Development Model. *Social Indicators Research*, vol. 97, no 1, pp. 43–63.

Inglehart R., Welzel C. (2005) *Modernization, Cultural Change and Democracy: The Human Development Sequence*. Cambridge: Cambridge University.

Kahneman D., Deaton A. (2010) High Income Improves Evaluation of Life but not Emotional Well-Being. *PNAS*, vol. 107, no 38, pp. 16489–16493.

Kainulainen S., Saari J., Veenhoven R. (2018) Life-Satisfaction Is More a Matter of Feeling-Well than Having-What-You-Want. Tests of Veenhoven's Theory. *International Journal of Happiness and Development*, vol. 4, no 3, pp. 209–235.

Khashchenko V. (2011) Subjektivnoe ekonomicheskoe blagopoluchie i ego izmerenie: postroenie oprosnika i ego validizatsiya [Subjective Economic Well-Being and Its Measurement: Constructing and Validating a Questionnaire]. *Experimental Psychology*, vol. 4, no 1, pp. 106–127.

Khavenson T., Orel E. (2014) Subjektivnoe blagopoluchie i udovletvorennost institutami: struktura i otsenka stepeni geterogennosti otvetov v evropejskikh stranakh [Subjective Well-Being and Satisfaction with Institutions: Structure and Assessment of Heterogeneity of Responses in European Countries]. *XIV Aprelskaya mezhdunarodnaya nauchnaya konferentsiya po problemam razvitiya ekonomiki i obshchestva: v 4-kh knigakh. Kniga 4* [XIV April International Scientific Conference on Economic and Social Development: In 4 Books. Book 4] (ed. E. G. Yasin), Moscow: HSE, pp. 540–553.

Klimenko L., Mosienko O., Nor-Arevyan O., Posukhova O. (2018) *Professionalnaya identichnost predstaviteley sotsialno orientirovannykh professiy v usloviyakh prekariatizatsii rossiyskogo obshchestva* [Professional Identity of Representatives of Socially Oriented Professions in the Conditions of Precariatization of Russian Society]. Rostov-on-Don: Foundation for Science and Education.

Klimenko L., Posukhova O. (2018) Professionalnaya identichnost shkolnykh uchiteley v usloviyakh prekariatizatsii sotsialno-trudovykh otnosheniy v krupnykh gorodakh Rossii [School Teachers' Professional Identity in the Context ofthe Precariatization of Social and Labor Relations in Large Russian Cities]. *Voprosy obrazovaniya / Educational Studies Moscow*, no 3, pp. 36–67. DOI: 10.17323/1814–9545–2018–3–36–67

Leontiev D. A. (2020) Schastye i subjektivnoe blagopoluchie: k konstruirovaniyu ponyatijnogo polya [Happiness and Well-Being: Toward the Construction of the Conceptual Field]. *Monitoring of Public Opinion: Economic and Social Changes*, no 1, pp. 14–37.

Melkumyan E. (2020) Religioznost i udovletvorennost zhiznju: opros pravoslavnykh prikhodov [Religiosity and Life Satisfaction: A Survey of Orthodox Parishes]. *Monitoring of Public Opinion: Economic and Social Changes*, no 1, pp. 225–249.

Mikhalkina E., Skachkova L. (2018) Pochemu vypuskniki aspirantury ne vybirayut rabotu v universitetakh? [Why Do Not PhD Students Choose Job in Universities?]. *Terra Economicus*, vol. 16, no 4, pp. 122–123.

Molokostova A., Yakimanskaya I. (2015) Sotsialno-psikhologicheskie aspekty bezopasnosti obrazovatelnoy sredy i subjektivnoe blagopoluchie spetsialistov pomogayushchikh professiy [Socio-Psychological Aspects of the Safety of the Educational Environment and the Subjective Well-Being of Specialists in Helping Professions]. *Vestnik Orenburgskogo Gosudarstvennogo Universiteta*, vol. 177, no 2, pp. 189–193.

Parfit D. (1984) *Reasons and Persons*. Oxford: Clarendon.

Santos J., Gonçalves S., Gomes A. (2013) Organizational Culture and Subjective and Work Well-Being. The Case of Employees of Portuguese Universities. *Journal of Spatial and Organizational Dynamics*, vol. 1, iss. 3, pp. 153–161.

Seligman M. E. P. (2002) *Authentic Happiness: Using the New Positive Psychology to Realize Your Potential for Lasting Fulfillment*. New York: The Free Press.

Sibirev V., Golovin N. (2020) Mezhpokolencheskie razlichiya v udovletvorennosti zhiznyu i chuvstve schastya v Rossii (na materialakh Evropejskogo sotsialnogo issledovaniya) [Intergenerational Differences in Life Satisfaction and a Feeling of Happiness in Russia (Based on the European Social Survey Data)]. *Monitoring of Public Opinion: Economic and Social Changes*, no 1, pp. 296–315.

Skachkova L., Shetinina D., Kriachko V. (2018) Faktory subjektivnogo blagopoluchiya nauchno-pedagogicheskikh rabotnikov: rezultaty focus-grupp [Factors of Subjective Well-Being of Scientific and Pedagogical Workers: Results of Focus-Groups]. *State and Municipal Management. Scholar Notes*, no 4, pp. 138–146.

Soboleva N. (2020) Faktory, vliyayushchie na vklad udovletvorennosti rabotoj v udovletvorennost zhiznyu v Rossii [Determinants and the Interrelationship Between Job Satisfaction and Life Satisfaction in Russia]. *Monitoring of Public Opinion: Economic and Social Changes*, no 1, pp. 368–390.

Sousa-Poza A., Sousa-Poza A.A. (2000) Well-Being at Work: A Cross-National Analysis of the Levels and Determinants of Job Satisfaction. *Journal of Socio-Economics*, vol. 29, no 6, pp. 517–538.

Troshikhina E., Manukyan V. (2017) Trevozhnost i ustojchivye emotsionalnye sostoyaniya v structure psikhoemotsionalnogo blagopoluchiya [Anxiety and Stable Emotional States in the Structure of Psycho-Emotional Wellbeing]. *Vestnik of Saint Petersburg University. Psychology*, vol. 7, iss. 3, pp. 211–223.

Vinogradova G. (2010) *Klimat v pedagogicheskom kollektive i subjektivnoe blagopoluchie Lichnosti pedagoga* [Climate in the Teaching Staff and Subjective Well-Being of the Teacher's Personality]. Tolyatti: TSU.

Volchik V., Klimenko L., Posukhova O. (2018) Socio-Economic Sustainable Development and the Precariat: A Case Study of Three Russian Cities. *Entrepreneurship and Sustainability Issues*, vol. 6, no 1, pp. 411–428.

Yashchenko E. (2012) Samoaktualizatsiya i subjektivnoe blagopoluchie kak sotsialno-psikhologicheskie problem professionalnogo obrazovaniya: student i prepodavateli universiteta [Self-Actualization and Subjective Wellbeing as Socially-Psychological Problems of Professional Education: University Students and Lecturers]. *Vestnik Yuzhno-Uralskogo gosudarstvennogo universiteta. Seriya: Psikhologiya*, no 31, pp. 56–63.

Ye D., Ng Y.-K., Lian Y. (2015) Culture and Happiness. *Social Indicators Research*, vol. 123, iss. 2, pp. 519–547.

Appendix 1.
Structure of the
Sample, %

Position	No. of federal universities	No. of respondents
Dean / Director of school	2	3
Head of department	5	8
Professor	12	12
Associate Professor	50	54
Senior Lecturer	20	14
Lecturer	3	3
Teaching Assistant	8	5

Based on the statistics of higher education institutions (Form VPO-1, Russia 2018) provided by the Ministry of Science and Higher Education of the Russian Federation.

Academic degree	No. of federal universities	No. of respondents
Doctor of Sciences	14	21
Candidate of Sciences	56	58
No degree	30	21

Appendix 2.
Bradburn's Affect
Balance Scale
[Bradburn 1969:56]

During the past few weeks, did you ever feel—

	Yes	No
1. Pleased about having accomplished something?	1	2
2. That things were going your way?	1	2
3. Proud because someone complimented you on something you had done?	1	2
4. Particularly excited or interested in something?	1	2
5. On top of the world?	1	2
6. So restless that you couldn't sit long in a chair?	1	2
7. Bored?	1	2
8. Depressed or very unhappy?	1	2
9. Very lonely or remote from other people?	1	2
10. Upset because someone criticized you?	1	2

Education in Ukraine: Quality Assessment and Development Prospects
Based on PISA-2018

V. Novikov, Ye. Makarova

Valery Novikov
Doctor of Sciences in Economics, Professor, Leading Researcher, Department for Human Development Studies, Ptoukha Institute for Demography and Social Studies, National Academy of Sciences of Ukraine.
Email: valery.economy@ukr.net

Yelena Makarova
Correspondent Member of the National Academy of Sciences of Ukraine, Doctor of Sciences in Economics, Senior Researcher, Deputy Director for Research, Ptoukha Institute for Demography and Social Studies, National Academy of Sciences of Ukraine.
Email: makarova_h@ukr.net

Address: 60 Tarasa Shevchenko Blvd, 01032 Kiev, Ukraine.

Abstract. In 2018, Ukraine joined the Programme for International Student Assessment (PISA). The results of PISA-2018 showed that Ukraine performed below the OECD average in all areas of literacy: reading, mathematics, and science. This outcome did not meet the public expectations. The expert society has not yet fully realized the critical potential of the obtained PISA results or started a broad discussion to evaluate them and outline the avenues for education reforms.

The article analyzes the PISA-2018 performance of Ukrainian students in reading, mathematics, and science literacy, as well as gender inequality, socioeconomic context, academic resilience and achievement.

Comparison of Ukraine's educational practices with those of EU countries, benchmark countries, and Russia is used to identify the common features of national education system development at the present-day stage and determine the specific aspects of institutional evolution in Ukrainian education. Public investment in education is analyzed and possible ways of improving its effectiveness are demonstrated. National education policy could be enhanced by updating the learning standards and competencies, raising teacher pay, extending professional development opportunities for teachers, increasing teacher motivation, developing the infrastructure, improving the inter-budgetary relations, and achieving better education statistics.

Keywords: educational quality, competence, literacy, inequality, equity, education policy, PISA-2018, Ukraine.

In the modern era of technology renewal, as financial, economic, and political institutions are advancing in the context of economic globalization and the growing geopolitical competition, educational quality

is becoming crucial for the development of national economies. International economic integration is increasing, providing a bi- and multilateral framework to ensure mobility of capital and, more importantly, workforce. As a result, international and domestic migration rates are growing, Ukraine and Russia being no exception. Over the course of three years (2016–2018), Russia accepted on average 155,300 migrants from Ukraine annually. This flow amounts to 26.3% of total migration from Ukraine, which makes Russia the second most popular destination for Ukrainian migrants after Poland [Libanova 2018:14]. Ukraine ranks second in terms of remittance flows from Russia to migrant workers' home countries [Chubar, Malishko 2019:63]. Along with labor migration, student migration constitutes an essential part of the migration flow from Ukraine to Russia, Russian universities being quite popular among Ukrainian high school graduates.

Modern educational researchers express their concerns about the global massification of higher education [Chou, Wang 2012; Ka Ho Mok, Jin Jiang 2016; Altbach, Reisberg, de Wit 2017]. As one of its consequences, education is degrading and, as result, losing its value. Commercialization of higher education has significantly eased the admission requirements, which inevitably affected the quality of school education.

Therefore, education policies are becoming a national priority for most of the countries in the 21st century. Globalization has added a distinctive feature to design of such policies: a tremendous influence of international organizations, such as UN, UNESCO, EU, OECD, and World Bank, which establish requirements for national education strategies. Mechanisms that are widely applied to meet those requirements include harmonization and standardization of national education policies to adapt the education systems to the current trends of socioeconomic development. This implies a transition from industrial technology to information technology and scientific computing, which are largely based on a high level of educational potential. Obviously—to Ukraine as well—reforms in education cannot be successful if they are implemented as a series of continuing local changes, often controversial and not connected by a common conceptual approach.[1] That is why it is important, using the results of PISA-2018, to give an objective assessment of educational quality in Ukraine and possible ways of improving it.

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[1] National Academy of Educational Sciences (2016) *Natsional'ny doklad o sostoyanii i perspektivakh razvitiya obrazovaniya v Ukraine* [National Report on the State and Prospects of Education Development in Ukraine], Kiev: National Academy of Educational Sciences, pp. 11–13. Available at: http://naps.gov.ua/ua/press/releases/1001/

1. Analysis of PISA-2018 Results

In 2018, Ukraine joined the Programme for International Student Assessment (PISA). The PISA methodology has become engrained in sociological practice as a technique for educational quality assessment. It represents a cumulative effect of a number of factors: age, gender, and family characteristics of students; type of education program; type, location, and resources of educational institutions. It is extremely difficult to measure the influence that each factor in isolation has on the quality of school education. In PISA, educational quality is assessed by measuring performance gains in the domains covered by the project. Because it was the first round for Ukraine, its results only reflect educational quality as of the end of 2018 and serve the basis for comparison with the OECD and benchmark countries. The latter include Belarus, Georgia, Estonia, Moldova, Poland, and Slovakia.[2]

PISA covers 87% of 15-year-olds in Ukraine (coverage index), compared to the OECD average of 88%. In Ukraine, unlike in many other countries, the PISA test was taken not only by school students but also by students of vocational schools and institutions of vocational higher education. The test measuring functional literacy of 15-year-old students was administered in 250 educational institutions in every region of the country (except localities adjacent to the conflict and buffer zones), secondary schools accounting for 79.2%, institutions of vocational higher education for 12%, and vocational schools for 8.8%.

The results of PISA-2018 showed that Ukraine performed below the OECD average in all areas of literacy: reading, mathematics, and science. This outcome did not meet the public expectations and even caused the so-called "PISA shock" in the educational community. A similar performance had been demonstrated by Russian school students in 2000, sparking a wide discussion on PISA results and ways to improve educational quality [National Research University Higher School of Economics 2004].

In PISA, educational quality is measured as the level of reading, mathematics, and science literacy. Each of the three domains has a baseline level of literacy (Level 2), at which students are required to demonstrate a minimum level of proficiency in reading, mathematics, and science, as well as independent thinking skills.

The PISA scale of proficiency was reviewed in 2018,[3] which should be taken into account when analyzing the levels of student literacy. This modification increases the probability of Ukraine performing below the OECD average and lower than the benchmark countries in each PISA domain. The gap is nearly equivalent to one year of schooling, which indicates that Ukraine is seriously falling behind in educational quality. The OECD equates 30 score points to one year of upper secondary schooling. Ukrainian students scored on average 465.95 in

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[2] Benchmark countries were selected based on whether they had socioeconomic similarities or shared some culture/history with Ukraine.

[3] Level 1 in reading and science was broken into two sub-levels: 1a and 1b.

reading, 453.12 in mathematics, and 468.99 in science, which is 23, 39, and 22 score points below the OECD average, respectively. Ukraine also performed lower than such benchmark countries as Estonia, Poland, Hungary, and Belarus, whose results approached the OECD average. The lowest performance was observed in mathematics, unlike in most benchmark countries.

Ukraine's best-performing students scored way below their counterparts in other countries. Level 3 and higher levels of literacy were achieved by only 46.4% in reading, 37.9% in mathematics, and 43.6% in science. Level 3 is the most common level of proficiency among 15-year-olds in the OECD countries. In Ukraine, the percentage of students performing at Level 3 or above is below the OECD average.

1.1. Reading Literacy

PISA results, in particular the percentage of students attaining Level 1a—just below the baseline,—indicate a lack of basic reading skills among Ukrainian students. For 16.7% of Ukrainian 15-year-olds, 1a is the highest level of proficiency they can achieve. Furthermore, there are those who perform at the bottom level of 1b, which includes very simple tasks for reading comprehension, such as finding the parts in a text where the explicit answers lie. The percentage of students scoring at Level 1b of reading literacy is 7.2% in Ukraine.

Students below Level 1b account for 2% in the Ukrainian sample, which is above the OECD average of 1.4%. Such students may understand the meaning of sentences or text passages, but they are unable to retrieve and synthesize information from the text, process long texts, or make simple inferences. International experts believe that adolescents scoring below Level 1b find it rather difficult to work with texts and thus have limited opportunities for obtaining a comprehensive education in the future.

1.2. Mathematics Literacy

Literacy in mathematics implies ability to apply the mathematical knowledge acquired in school in various contexts that require reasoning, intuition, and thinking out of the box. Students performing at Level 1 on the PISA scale can follow simple procedures, such as arithmetic operations to find obvious solutions. This level of proficiency in mathematics is observed in 20.3% of Ukrainian 15-year-olds. However, 15.6% do not achieve even this level, being unable to solve a problem that gives all the necessary information, asks a clearly formulated question, and only requires following a standard procedure in a familiar context according to explicit instructions. The baseline level (Level 2) of mathematics literacy is not achieved by 36.0% of students in Ukraine. This percentage is way above the OECD average as well as the percentages in Estonia, Poland, Slovakia, and Belarus, yet somewhat lower than in Georgia and Moldova.

1.3. Science Literacy

Similar to the other two domains, test items measuring science literacy require that students be able to synthesize information and make

inferences based on the changes in everyday life and environment induced by scientific and technology development. The lowest levels of science literacy are Levels 1a and 1b (and below Level 1b). At Level 1a, students can choose the best scientific explanation of obtained data in familiar contexts. Students scoring at Level 1b are able to use the most basic subject knowledge to identify specific aspects of simple scientific phenomena. In Ukraine, only 19.2% of students reached Level 1a, and 7.3% scored lower. Level 1b was the highest achievable level for 6.3% of 15-year-olds in Ukraine, and 1% scored even lower, as compared to the OECD averages of 5.2 and 0.7%, respectively.

1.4. Gender Inequality

Ensuring gender equality of opportunity and outcome in education is a pressing issue for a lot of countries, and many of them tackle it effectively. Ukraine demonstrates essential gender disparities, particularly in reading, where boys perform considerably lower (450.1) than girls (483.6). Ukraine's gender gap of 33.5 score points in reading literacy is above the OECD average of 30.1 and wider than in the benchmark countries (except Georgia and Moldova with their gaps of 38 and 40 score points, respectively).

Boys score higher than girls in mathematics. The gender gap in this domain is 7 score points, as compared to the OECD average of 4.8. However, this difference is not statistically significant. Similar gender gaps are observed in Belarus and Estonia.

No gender disparities in scientific performance were revealed in most PISA-participating countries. In Ukraine, boys outperform girls by 1.7 score points. In the OECD countries, meanwhile, girls have an average advantage of 2.8 points over boys, similar to the rates in Estonia, Poland, Belarus, Hungary, and Slovakia. A slightly wider performance gap in science (in favor of girls) is observed in Moldova and Georgia.

1.5. Socioeconomic Context

PISA looks for correlations between students' performance and a number of factors describing their socioeconomic status (SES). Socioeconomic disparities in education are assessed using three indicators that reflect the relationship between learning outcomes and SES: the average level, the average rate of change, and the strength of correlation. The average level shows whether students in a specific country or education system perform better or worse than their peers from similar socioeconomic backgrounds in other countries. The average rate of change shows to what extent students in better socioeconomic contexts perform better than those from less advantaged backgrounds and lower-income families. The strength of correlation shows the chances for low-SES students to perform as high as their high-SES counterparts.

Table 1 compares the socioeconomic disparities in education between Ukraine and other countries. The average level of reading literacy among 15-year-olds in Ukraine (475.3) is significantly lower than among students with similar SES in the OECD countries (488.4).

Table 1. **The key indicators of socioeconomic inequality in education**

	Average level		Average rate of change		Strength of correlation*	
	Mean	S.E.	Score gap	S.E.	%	S.E.
Belarus	480.5	1.89	51.3	2.15	20	0.01
Georgia	391.7	2.33	27.9	1.8	9	0.01
Estonia	521.7	1.77	28.7	2.11	6	0.01
Moldova	449.0	2.59	41.7	2.01	17	0.02
Poland	518.3	2.41	39.0	2.56	12	0.01
OECD	488.4	0.38	36.7	0.3	6	0.01
Slovakia	467.7	1.92	45.6	2.06	18	0.02
Hungary	482.0	2.13	45.9	2.22	19	0.02
Ukraine	475.3	2.7	45.2	2.48	14	0.01

Note: The strength of correlation is the percentage of variation in reading performance explained by SES.
Source: Ukrainian Center for Educational Quality Assessment (2019) *Natsional'ny otchet po rezul'tatam issledovaniya kachestva obrazovaniya. PISA-2018* [Ukraine's National PISA-2018 Report], Kiev: Ukrainian Center for Educational Quality Assessment, pp. 66–67.

The average rate of change (difference in reading scores corresponding to a one-point increase in SES) is much higher in Ukraine (45.2) than in the OECD countries (36.7). In Georgia and Estonia, the rate is essentially lower (27.9 and 28.7, respectively), which indicates more educational equity in terms of SES in these countries and a high degree of social stratification in Ukraine.

SES explains 14% of variation in reading performance in Ukraine, which is close to such OECD countries as Hungary and Slovakia, lower than in Moldova and Belarus, and higher than in the other benchmark countries.

Performance of Ukrainian students from low-SES backgrounds is comparable to that of Belarusian 15-year-olds sharing the same status, yet the SES-related rate of change in the test scores is lower in Ukraine than in Belarus. There is a considerable performance gap between high- and low-SES students. However, the probability of scoring high for low-SES students is about the same as in the OECD countries and in most of the benchmark countries (except Estonia, Poland, and Georgia).

Students with a medium SES in Ukraine are 2.5 times more likely to achieve the baseline level pf proficiency in reading than their low-SES peers (2.3 times more likely in mathematics and 2.1 times more likely in science). High-SES students' chances of scoring above the base-

Table 2. **Resilient students in Ukraine vs. the OECD average**, %

	International (relative) resilience			National resilience		
	Reading	Mathematics	Science	Reading	Mathematics	Science
Ukraine	4.6	17.8	23.8	11.7	12	12.8
OECD average	3.8	24	23	11.4	10.9	11.4

Source: Ukrainian Center for Educational Quality Assessment (2019) *Natsionalny otchet po rezul-tatam issledovaniya kachestva obrazovaniya. PISA-2018* [Ukraine's National PISA-2018 Report], Kiev: Ukrainian Center for Educational Quality Assessment, pp. 74.

line in all domains are 2.6 times higher than those of medium-SES students and almost 6 times higher than those of low-SES students.

1.6. Academic Resilience and Achievement

PISA had adopted a step-by-step approach to the problem of access to quality education, which suggests ensuring academic resilience prior to making education universally accessible.

Resilience is key to achieving equity in education. PISA defines resilient students as those who come from disadvantaged backgrounds, e. g. from low-SES families or with negative social experiences, but still exhibit high levels of success by being assiduous and interested in getting an education.

Resilience in PISA is examined using international, national, and "core-skills" perspectives. Core-skills resilience is the ability of disadvantaged students to achieve good levels of performance in all three core PISA domains. The threshold used in the core-skills definition is absolute in the sense that disadvantaged students need to perform at a certain given threshold that is the same for all students. The cut-off point to reach proficiency Level 3 in each subject does not vary across countries.

When the performance level is assessed with reference to a specific country, the threshold is relative (Table 2). Percentages of internationally and nationally resilient students in Ukraine are comparable to those of OECD countries (except international resilience in mathematics). Expansion of this category of students will help increase the overall literacy rates and reduce the socioeconomic achievement gaps.

PISA examines the influence of specific learning environment and school characteristics on student achievement. Such characteristics include residential segregation, segregation based on income or on cultural or ethnic background, the structure of the upper secondary education system, education programs, and system-level education policies, e. g. differences in school autonomy.

To measure the impact of specific factors on academic achievement, it is important to analyze the variation in variables that directly affect the quality of education in the core PISA domains, since levels of

literacy vary between schools as well as within them. Between-school variation in PISA scores accounts for 30% of total variation in Ukraine, which is higher than in Belarus, Moldova, Georgia, Estonia, and Poland. It means that school segregation in Ukraine is higher than in these benchmark countries.

To some extent, variation in educational quality reflects differences in the quality of teaching between urban and rural schools as well as between different types of schools. Reading performance in Ukraine differs significantly between rural and urban students. Rural students score on average 420.6, falling more than 2.5 years of schooling behind their urban counterparts. Performance gaps in mathematics and science are even wider: the average mathematics score in rural schools is 408.1, which is nearly three years of schooling lower than in urban areas (494.1).

Average reading score in lyceums, gymnasiums, and specialized schools is 509.9, which is essentially higher than in regular schools (464.6) and vocational institutions (440.1). Vocational school students fall approximately 1.5–2 years of schooling behind their peers in lyceums, gymnasiums, and specialized schools.

The differences in educational quality between Ukraine and other countries revealed in the course of PISA can hardly be explained by any single factor. Interplay of various factors affecting the quality of education requires a deeper analysis that would account for a system of indicators reflecting different levels of education and types of educational institutions.

However, PISA results make it clear that educational quality in Ukraine is way below the European level. Among the 79 PISA-participating countries, Ukraine is ranked 40th in reading, 43rd in mathematics, and 38th in science. The average PISA score of Ukrainian students is 21 points lower than the OECD average, 57 points lower than in Estonia, 46 points lower than in Poland, and 8 points lower than in Belarus. Russia, too, outperforms Ukraine by 21 score points (Table 3).

Despite some decline in Russia's performance between 2015 and 2018, PISA experts still rank it among the successful countries that improved in at least two assessment areas.[4] By 2018, Russia had made certain advancements in education development, compared to earlier assessments. An improvement in the educational standards had a positive effect on the learning process. Governance of educational institutions also underwent some positive changes. Decentralization initiatives provided conditions for enhancing financial stability of educational institutions. The network of small schools had grown. Performance in mathematics had improved by 20 score points since 2003.

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[4] Mironova K. (2019) Rossiyskie shkol'niki ne spravilis' s ekzamenom [Russian School Students Failed the Test]. *Kommersant*, February 17, 2020. Available at: http://www.kommersant.ru/doc/4180047

Table 3. **Comparing the PISA-2018 performance of Ukraine and Russia to that of other countries.**

	Mean PISA score
PISA average	453
OECD average	487
Russia	479
Ukraine	466
Benchmark countries:	
Estonia	523
Poland	512
Belarus	474
Slovakia	458
Moldova	424
Georgia	380

Note: Scores are converted into an international 1,000-point scale with a mean of 500.
Source: Ukrainian Center for Educational Quality Assessment (2019) *Natsionalny otchet po rezultatam issledovaniya kachestva obrazovaniya. PISA-2018* [Ukraine's National PISA-2018 Report], Kiev: Ukrainian Center for Educational Quality Assessment.

Scientific literacy, however, remained at the level of 2006, when it was first assessed.[5]

1.7. Resources   Changes in education spending are indispensable to promote innovative development of the system. According to PISA, Ukraine's expenditure on education accounted for 13.1% of total public spending and 5.4% of GDP, almost meeting the benchmark levels of the sustainable development goal (SDG) targets for education. However, spending per student is much lower in Ukraine than in the majority of European countries. Apart from provision and equipment (infrastructure, instructional materials), education spending items also include teach-

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[5] Ministry of Education of the Russian Federation (2019) *Po itogam PISA Rossiya voshla v 18 stran s ustoychivym progressom kachestva shkol'nogo obrazovaniya* [PISA Ranks Russia among 18 Countries with Consistent Improvements in School Education Quality]. December 3, 2019. Available at: https://edu.gov.ru/press/1979/po-itogam-pisa-rossiya-voshla-v-18-stran-s-ustoychivym-progressom-kachestva-shkolnogo-obrazovaniya/

er remuneration and extracurricular activities. The average of OECD countries' cumulative expenditure per student between the age of 6 and 15 was in excess of 100,000 in equivalent USD converted to PPPs in 2018. Ukraine, meanwhile, spent only USD26,647 per student.[6] This level of spending is insufficient to achieve the SDG targets for education, one of which consists in substantially increasing the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs, and entrepreneurship by 2030.[7]

Insufficient funding inhibits not only infrastructure development but also the purchase of educational supplies, considerably complicating the learning process. Shortage or inadequate quality of the relevant infrastructure (e. g. buildings, HVAC systems, lighting, audiovisual aids) are experienced by over 40% of educational institutions in Ukraine[8]. Low access to computers for pedagogical purposes and computers connected to the Internet available for students for educational purposes, lack of adequate Internet connections, and low access to software are typical of 70% of schools. In addition, 62% of educational institutions lack computer service technicians. The level of school ICT equipment in Ukraine is below the OECD average and lower than in the benchmark countries. Ukraine's index of shortage of material resources in schools is 0.75, as compared to the OECD average of 0.02, 0.34 in Moldova, and 0.17 in Georgia. In Belarus and Poland, educational and material resources are even in excess, their indices of shortage being −34 and −33, respectively.[9]

2. Avenues for Improving National Education Policies

Education system as a public institution is inert, meaning that it adapts with a certain time lag to the changing requirements imposed by socioeconomic transformations. Educational standards, which serve as benchmarks for upgrading the existing model of instruction, require that school students not only learn the basic skills and competencies but also develop personal qualities that will allow them to apply the acquired knowledge in everyday life.

Nowadays, the quality of education in Ukrainian schools is such that students' basic skills are below the baseline level of 15%, which

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[6] Ukrainian Center for Educational Quality Assessment (2019) *Natsional'ny otchet po rezul'tatam issledovaniya kachestva obrazovaniya. PISA-2018* [Ukraine's National PISA-2018 Report], Kiev: Ukrainian Center for Educational Quality Assessment, p. 157.

[7] *Tseli ustoychivogo razvitiya: Ukraina* [Sustainable Development Goals: Ukraine]. Available at: http://www.un.org.ua/ua/tsili-rozvytku-tysiacholittia/tsili-staloho-rozvytku

[8] Ukrainian Center for Educational Quality Assessment (2019) *Natsional'ny otchet po rezul'tatam issledovaniya kachestva obrazovaniya. PISA-2018* [Ukraine's National PISA-2018 Report], Kiev: Ukrainian Center for Educational Quality Assessment, pp. 167–168.

[9] Ibid., p. 171.

was projected in 2016 to be universally achieved by 2020 as a critical indicator of education development in Ukraine.[10] In terms of mean PISA scores, 29.4% of Ukrainian students perform below the baseline level of proficiency. Percentages of students scoring below the baseline level of functional literacy are 25.9% in reading, 36% in mathematics, and 26.4% in science.

One of the reasons for low performance is that school students in Ukraine were unfamiliar with the modern academic assessment standards. They had never taken tests assessing their ability to think independently, formulate their own viewpoint on social phenomena, apply mathematical knowledge to solve unconventional problems, synthesize knowledge from different subjects such as physics, chemistry and biology, apply the acquired scientific knowledge in everyday life, understand, explain, or reproduce natural phenomena and processes. Insufficiency of school knowledge for passing the PISA test is a major reason for Ukraine falling behind in educational quality. As a remedy to this situation, a number of important initiatives should be undertaken to make graduates of Ukrainian schools more competitive.

In the long-term perspective, a system of functional literacy assessment at all key stages of education should be introduced and developed to monitor individual trajectories of student progress. Prior educational assessments did not provide enough information. A regular student evaluation system should be established at the national level to allow for a differentiated assessment. Creating a national system for monitoring the learning gains of school students in Ukraine would allow for assuring an adequate level of educational quality at both national and local levels.

The existing instructional design priorities should be reviewed and new ones should be set to create conditions for the development of innovation skills. National educational standards in reading, mathematics, and science, updated with due regard for the new priorities, should become obligatory. Furthermore, national standards should be differentiated in accordance with the international levels of educational quality, including descriptions and the range of performance within each level.

To allow effective implementation of the new educational standards, it is vitally important to establish the minimum funding requirements and align them with the budgets of local educational institutions and authorities. So far, the budgetary capacity of the education system is not based on the educational standards. If these two instru-

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[10] National Academy of Educational Sciences (2016) *Natsional'ny doklad o sostoyanii i perspektivakh razvitiya obrazovaniya v Ukraine* [National Report on the State and Prospects of Education Development in Ukraine], Kiev: National Academy of Educational Sciences. Available at: http://naps.gov.ua/ua/press/releases/1001/

ments are not combined in a single mechanism over a medium-term horizon, educational quality will be impossible to improve.

The social demand for improvements in educational quality implies following the principle of equity in policy for lifelong learning. Today, equal access to quality education is achieved first of all by increasing funding for education to mitigate the harmful effects of education subsidies. Right now, the budgetary policy is rather formalized. The philosophy of competency-based learning suggests applying new budgeting methods to make funding allocation as objective as possible. The need to integrate such new methods is dictated by the ever-increasing instability of public investments in education and the growing inadequacy between public education spending and the population of students. The linear correlation coefficient between spending and enrollment decreased from 0.972 to 0.776 in 13 years, and there are no apparent reasons for this gap to start reducing. This inadequacy is a permanent factor of budgetary imbalances in educational institutions, making it hard to provide equal access to education. To overcome this disproportion, it is necessary to improve the mechanism of adjustment factors in educational budgeting. Ukraine's Budgetary Code provides for only two types of adjustment factors: population size and socioeconomic and demographic differences between regions. No allowance is made for educational infrastructure indicators, while they determine not only the physical condition and equipment of learning environments but also the size of funding. The budgetary mechanisms of Ukraine's education system should include coefficients of depreciation of school infrastructure, including buildings, facilities, and equipment.

Adequacy of Ukrainian schools' material and educational resources of is directly associated with their location and, to some extent, their socioeconomic context. Resources are the main prerequisite for achieving high levels of learning outcomes and promoting equity in education within low-SES schools. Socioeconomically disadvantaged schools are often found in rural areas of Ukraine, for example. A dedicated policy should be applied to upgrade the resources of such schools.

Teacher remuneration remains an area of concern, too. Ukraine's National PISA 2018 Report observes a difficulty of estimating the average salary of Ukrainian school teachers. This indicator depends on a number of factors including increments, supplemental pay, and other extra payments. The existing system for collecting data on teachers' salaries does not allow accurate calculations.[11] This budget management issue could be solved by establishing a minimum threshold for

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[11] Ukrainian Center for Educational Quality Assessment (2019) *Natsional'ny otchet po rezul'tatam issledovaniya kachestva obrazovaniya. PISA-2018* [Ukraine's National PISA-2018 Report], Kiev: Ukrainian Center for Educational Quality Assessment, pp. 162.

spending per student. For this purpose, a model of educational standard has been introduced, which is based on projections for per-student costs of standard "budgetary services" and makes allowance for maximum class size, sanitary norms, differences in tuition at different stages of education, types of education programs and educational institutions, student composition, and other factors.

It is clearly understood by the general public that Ukraine's education system has exhausted its potential for extensive development. New approaches meeting the modern requirements are needed to build up the country's educational potential. In 2017, a new formula for allocation of educational subvention covering teachers' salaries among the local budgets was introduced and endorsed by the government. The new formula allows allocating budgetary resources with due regard for class size and regional school differences.[12] The incentive effect of subvention on teaching quality is beyond doubt, but its life span is limited. The subvention part accounts for 56.6% of total expenditure on teachers' salaries in the structure of Ukraine's education spending. Meanwhile, the average annual growth rate of expenditure on teacher remuneration, all extra payments included, is 8.8%, and spending on goods and services (materials, equipment, energy supplies, etc.) decreases by an average of 10% every year. Such an imbalance in the structure of public spending on education emphasizes the need for new, comprehensive approaches to financing in the education sector, which require unconventional funding mechanisms.

Ukrainian periodicals have repeatedly addressed the salience of financial issues in education [Khomishin 2018; Kurko 2010]. Education budgeting practices need to be discussed widely and thoroughly.

In 2016, a policy concept of "New Ukrainian School" for the period of up to 2029[13] was developed to enhance the system of secondary education. The fiercest disputes arose over the aspects of education policy that involved the most dramatic transformations: pedagogy of partnership, innovation readiness, new standards and learning outcomes, school and teacher autonomy, and education funding. Based on this concept, a law to reform the system of secondary education was adopted in 2020.[14] A lot of effort has to be made in 2021 to prepare and submit implementation scenarios to the legislative authorities.

Reliable educational statistics is the core of education policy design. Ukraine's government statistics provides very limited data on

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[12] Resolution of the Cabinet of Ministers of Ukraine No. 114 "On Amending the Formula for Allocation of Educational Subvention among the Local Budgets" of February 19, 2020. Available at: https://zakon.rada.gov.ua/laws/show/114–2020-%D0%BF#Text

[13] Resolution of the Cabinet of Ministers of Ukraine *On Endorsing the Policy Concept of "New Ukrainian School" for the Period of up to 2029* of December 14, 2016. Available at: https://www.kmu.gov.ua/ua/npas/249613934

[14] On Secondary Education. Available at: https://zakon.rada.gov.ua/laws/show/463–20#Text

the economic and financial module of education. A deeper and more extensive statistical research is required to elaborate the objectives of education development in the context of the ever more rigorous education quality standards. Conceptual approaches to educational statistics have evolved over the last years in terms of national standards. However, such data is presented with a time lag and is essentially macroeconomic. The structure of statistical indicators gathered by the Ministry of Finance of Ukraine and the State Statistics Service of Ukraine is poorly associated with the demographic potential, labor market, teacher remuneration, employment patterns, household income, educational quality, and allocation of funding among the regions and types of educational institutions. Reform of the education system will imply solving the problem of gathering additional statistical data, including the statistical functionality of local governments and amalgamated territorial communities, and harmonization of data between them.

3. Conclusion PISA results reflect a modern approach to education development based on achieving functional literacy and improving educational quality, which implies not only the acquisition of subject knowledge but also learning to communicate and apply knowledge in real life and the development of adequate behavioral strategies.

Average PISA performance of Ukrainian students shows that their levels of functional literacy in reading, mathematics, and science are too low to solve problems that require not only subject knowledge but also ability to deal with the practical aspects of life. If nothing is done, the Ukrainian segment of national and global labor markets will face a shortage of employees with relevant production and organizational skills.

The inferences from analysis of PISA results allowed developing an action plan for improving the quality of education in Ukraine, which makes no pretense to exhaustiveness but is premised on objective data and education research findings.

References   Altbach P. G., Reisberg L., de Wit H. (eds) (2017). *Responding to Massification. Differentiation in Postsecondary Education Worldwide.* Dordrecht: Sense.

Chou P., Wang L.-T. (2012) Who Benefits from the Massification of Higher Education in Taiwan? *Chinese Education & Society*, vol. 45, no 5, pp. 8–20.

Chubar O., Malishko K. (2019) Groshovi perekazi trudovikh migrantiv v Ukrainu: makroekonomichni tendentsii ta regionalni osoblivosti [Remittances of Labor Migrants to Ukraine: Macroeconomic Trends and Regional Features]. *Demografiya ta sotsialna politika*, vol. 3, no 37, pp. 57–72.

HSE (2004) Neochevidnye uroki mezhdunarodnogo issledovaniya PISA-2000. Krugly stol [Non-Obvious Lessons from International Research PISA-2000. Round Table]. *Voprosy obrazovaniya / Educational Studies Moscow*, no 1, pp. 119–137.

Ka Ho Mok, Jin Jiang (2016) *Massification of Higher Education: Challenges for Admissions and Graduate Employment in China.* Available at: https://www.researchcghe.org/publications/working-paper/massification-of-higher-education-challenges-for-admissions-and-graduate-employment-in-china/ (accessed 20 September 2020).

Khomishin I. (2018) *Napryami reformuvannya shkilnoy osviti* [Directions of School Education Reform]. Available at: http://science.lpnu.ua/sites/default/files/journal-paper/2019/jan/15425/.15.pdf (accessed 20 September 2020).

Kurko M. (2010) Stan ta normativno-pravove vregulyuvannya finansovogo zabespecheniya osviti [State and Legal Regulation of Financial Provision of Education]. *Law and Safety*, no 1, pp. 140–143. Available at: http://nbuv.gov.ua/UJRN/Pib_2010_1_33 (accessed 20 September 2020).

Libanova E. (2018) Zovnishni trudovi migratsii ukraintsiv: masshtabi, prichini, naslidki [External Labor Migration of Ukrainians: Scale, Causes, Consequences]. *Demografiya ta sotsialna politika*, vol. 2, no 33, pp. 11–26.

School Socioeconomic Composition as a Factor of Educational Inequality Reproduction

Yu. Kersha

Yuliya Kersha
Postgraduate Student, Research Assistant, Pinsky Centre of General and Extracurricular Education; Lecturer, Department of Educational Programs, Institute of Education, National Research University Higher School of Economics. Address: 20 Myasnitskaya St, 10100 Moscow, Russian Federation
 Email: ykersha@hse.ru

Abstract. It can be inferred from international findings that school socioeconomic composition (SEC) is a major factor of educational inequality in secondary education. Along with individual student characteristics, SEC is believed to have a direct impact on student achievement. However, a review of research methods used in most studies calls the existence of a direct influence into question.

A study was carried out to evaluate causal relations between school SEC and student achievement. Multilevel regression analysis and propensity score matching (PSM) methods were applied to the data obtained in the panel study Trajectories in Education and Careers in order to measure the effects of one year of attending a low- vs. high-SEC school.

Correlational and quasi-experimental effect sizes were compared.

Analysis results confirm that school SEC is a key factor of educational inequality in Russian secondary education. The inequality effects of school composition overlapping only partially with those of school location. Within a year of schooling, ninth-graders with similar individual characteristics may lose up to a quarter of standard deviation in their PISA-2012 scores if attending a low-SEC school, while attending a high-SEC school is associated with improvements in educational outcomes by the end of the ninth grade. Negative effects were observed for two subject areas, which allows suggesting a systematic impact of SEC on student achievement. The final part of the article describes the theoretical and practical significance of the findings and presents the main directions of further research in the field.

Keywords: social inequality, educational inequality, school socioeconomic composition, quasi-experimental research designs, propensity score matching, academic achievement.

Today, social mobility gradually becomes not just an advantage of a fair democratic system but also a prerequisite for development. Low upward social mobility, closely associated with inequality of opportunity, hinders national human capital accumulation, retards econom-

ic growth, and undermines social cohesion and engagement [Aiyar, Ebeke 2019; World Economic Forum 2019].

In 2020, the World Economic Forum provided an assessment of 82 global economies according to their performance on social mobility. The Russian Federation ranks 39th [World Economic Forum 2020]. This is no tragedy, yet it follows from the assessment results that the life chances of Russians are largely contingent on their sociodemographic characteristics, such as place of residence, social status, parental education, etc. Children born into less socially advantaged circumstances encounter a number of high barriers to moving up the social ladder.

Education is a powerful "equalizer" of chances [Esping-Andersen 2015; World Economic Forum 2020]. Ensuring that individuals have equal opportunities to access quality education is a key goal of an effective social system [Field, Kuczera, Pont 2007]. A school's ability to give its students a chance for upward social mobility through learning becomes an indicator of quality education [Konstantinovskiy et al. 2006]. However, equity does not mean that all students obtain equal educational outcomes, but rather that differences in students' outcomes are unrelated to their background or to economic and social circumstances over which students have no control.

The real situation in education is somewhat different from the ideal. A lot of countries have witnessed a sharp increase in educational inequality in recent years [OECD 2018]. Russia, too, demonstrates significant sociodemographic disparities in student performance. Social and regional inequalities in school education are quite salient [Amini, Nivorozhkin 2015; Kapuza et al. 2017; Konstantinovskiy 2010; Froumin, Pinskaya, Kosaretsky 2012]. Students with different levels of socio-economic capital differ not only in their academic achievement but also in their post-school educational trajectories [Khavenson, Chirkina 2018; Kosyakova et al. 2016].

A number of studies examine the role of school in promoting educational inequality [Blossfeld et al. 2016; Borman, Dowling 2010; Condron 2009; Duncan, Murnane 2011; Oppedisano, Turati 2015]. However, researchers often find it challenging to distinguish the direct effects of school from the influence of individual student characteristics on the learning outcomes. No clear answers have been found so far. This state of affairs in sociology of education being sometimes described as a "theoretical vertigo" [Condron, Downey 2016]. According to various studies schools can reproduce preexisting inequalities, magnify them, or help reduce them.

On average 41% of outcome variance may be explained by covariates at the school level [Brunner et al. 2018], of which socioeconomic composition (SEC) is the strongest predictor [Coleman 1966]. School composition is normally expressed in studies as a school- or class-level aggregated socioeconomic status (SES) data [Perry 2012]. Social class composition of a student's school can be 2.5 times more

important than a student's individual social class for understanding educational outcomes [Borman, Dowling 2010].

International findings obtained in studies assessing the impact of school SEC on student performance are controversial. In most publications, the effects of SEC are qualified as positive [Bartholo, Costa 2016; Belfi et al. 2014; Chesters, Daly 2017; Danhier 2017; Opdenakker, Damme 2007; Palardy, Rumberger, Butler 2015; Perry, McConney 2010; Agirdag 2018; Langenkamp, Carbonaro 2018; Niu, Tienda 2013; Palardy 2013; Rjosk et al. 2014]. Students in high-SEC schools exhibit higher attainment and are more likely to choose academic-track pathways after graduation. These results have been confirmed across a variety of countries: the United States, Belgium, Australia, Brazil, and others.

At the same time, some scholars believe that the compositional effect does not exist and represents a statistical artifact resulting from methodological pitfalls [Boonen et al. 2014; Flouri, Midouhas 2016; Marks 2015; McCoy, Quail, Smyth 2014; Televantou et al. 2015; Armor, Marks, Malatinszky 2018]. In particular, opponents emphasize the importance of using multilevel modelling for longitudinal data and taking account of prior attainment in the models. Addition of some indicators of prior attainment on individual level can make compositional effect insignificant.

Nearly all studies on the school composition effect use correlational designs based on regression analysis or structural equation modelling. A major limitation of these methods is the self-selection of students into different types of schools [Murnane, Willett 2011]. High-SEC schools are chosen by students who differ in their individual characteristics from those who enroll in low-SEC schools. As a result, the observed compositional effect may be overestimated due to unaccounted individual differences. Experimental and quasi-experimental designs should be applied to overcome the self-selection bias and evaluate the causal relationship between school type and academic achievement. Of all the literature reviewed, only one publication used a quasi-experimental framework and revealed a positive impact of primary school SEC on students' mathematics achievement growth [Belfi, Haelermans, De Fraine 2016]. There are no findings on the influence of school composition on academic performance in middle or high school yet.

This study, designed with consideration of criticism for prior research and its methods, seeks to assess the impact of school SEC on student achievement that is independent from individual student characteristics. Along with regression analysis, traditionally applied in most publications, this study also uses a quasi-experiment to compare the results. The main research question is articulated as follows: what is the effect of one year of attending a low- vs. high-SEC school on academic achievement?

1. Research Methodology
1.1. Data

The study uses data from the panel study Trajectories in Education and Careers (TrEC)[1]. This project started in 2011, when eighth-graders from 210 schools in 42 regions of Russia participated in the Trends in International Mathematics and Science Study (TIMSS). The sample, composed of 4,893 respondents, was representative of Russian eighth-graders in 2011. The survey assessed student achievement in mathematics and science and also collected contextual data on school and family characteristics. At the end of the 9th grade, the same sample participated in the Programme for International Student Assessment (PISA), which measured literacy in mathematics, science, and reading. The original sample for the present study included 4,399 students who were respondents in both assessments. The final sample consists of those who did not change school in grades 8–9.

1.2. Variables

Information for the longitudinal study was gathered at two levels: student (including student's family) and school. The study makes use of variables corresponding to both levels. All interval variables included in analysis were standardized to a mean of 0 and standard deviation (SD) of 1. Descriptive statistics for non-standardized variables is presented in Appendix 1.

1.2.1. Covariates

A few variables reflecting the school characteristics and the main sociodemographic parameters of students were used as control variables.

At the student level, gender was controlled for by coding girls as '1' and boys as '0'. Student age in grade 8 was treated as an interval variable derived from the month and day of birth. Ethnicity was conventionally assessed through the prevalence of speaking Russian at home, where "Always" was coded as '1', and "Almost always", "Sometimes", and "Never" were coded as '0'.

Making allowance for previous-year achievement is indispensable to ensure accurate estimation of the compositional effect [Armor, Marks, Malatinszky 2018]. For this purpose students' performance in TIMSS-2011 mathematics and science was considered in analysis. TIMSS uses a 1,000-point scale with five plausible values (PV), which were assigned to every student and averaged to calculate the mean achievement score in two subjects.

Individual SES has been traditionally considered to have a tripartite nature that incorporates parental income, parental education, and parental occupation [Sirin 2005]. Studies examining the school composition effect often use parental education alone, as it appears to be the strongest predictor of SES [Buckingham, Wheldall, Beaman-Wheldall 2013]. Besides, questions about this component are unlikely to remain unanswered by respondents, compared to the other components of SES. For this reason, parental education is used in the

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[1] http://trec.hse.ru/

present study as a characteristic of SES at both student and school levels. The TIMSS variable describing parents' highest level of education was used as a basis for constructing a variable coded as '1' if a student had at least one parent with higher education and '0' if both parents had no degree.

School SEC is represented as a school-level aggregated SES (parental education), specifically as a percentage of students with at least one parent with a degree. A higher percentage means a higher proportion of advantaged students, hence a higher level of SEC. Since the sample consisted of students from the same cohort, the indicator of school composition was based on observations within that cohort only. Here it is assumed that different cohorts within the same school don't differ significantly in their social composition. In addition to the percentage of high-SES students, SD for this variable at school was added as a source of additional information about the influence of student heterogeneity on the school composition effect.

At the school level, allowance was made for the size of locality. Three types of localities were identified: cities (≥100,000 inhabitants), towns (15,000–100,000), and rural settlements (<15,000). All the three types were included in analysis as individual dichotomous variables. School type was also registered as a dichotomous variable with '1' for gymnasiums, specialized schools, and regular schools offering gymnasium classes, and '0' for other types of schools. School size was treated as an interval variable reflecting the total number of students enrolled in a school. Additionally, analysis took account of ethnic school composition, expressed as a percentage of eighth-graders who always speak Russian at home.

1.2.2. Dependent variable

Academic achievement at the end of the 9th grade was assessed through performance in PISA-2012. Students' scores in two subjects, mathematics and science, were used in analysis. Each subject was analyzed separately. Students' performance was assessed on a 1,000-point scale with five PVs. As with TIMSS, the PVs were used to calculate the mean.

1.2.3. Treatment variable

The treatment variable, based on school SEC, was used for the quasi-experiment. Distribution of the variable at the school level was used for identifying low-SEC (the bottom 40%) and high-SEC (the top 40%) schools. Attending a low-SEC school in the 9th grade was coded as '1'. It means that in this study learning at school with a low-SEC is considered as intervention. Hence, ninth-graders attending a high-SEC school formed the control group, and the treatment variable in this case was equal to 0. Students enrolled in schools in the middle 20% of the distribution were excluded from analysis at the stage of quasi-experimental effect assessment. In this research, the treatment variable is treated as complex, in a broad sense meaning that a student attends a specific type of school with certain composition. As

a result, all the learning process characteristics that may be associated with school composition in the 9th grade are qualified as treatment. Which learning characteristics exactly are associated with the effect of school composition on outcome variable is beyond the scope of this article.

1.3. Analysis strategy

Assessment of the compositional effect is methodologically different from merely searching for achievement differences related to differences in the social composition of students [Harker, Tymms 2004]. A compositional effect exists when the school-level aggregated variable makes a significant contribution to the explanation of outcome variance after controlling for the same variable at the individual level. In contrast to studies that measure the relationship between school composition and student achievement [Yastrebov et al. 2014; Kosaretsky, Grunicheva, Pinskaya 2014], this one follows methodology for the compositional effect assessment.

At the first stage of data analysis, linear multilevel regression models were used to measure the compositional effect for the whole sample of schools. Two groups of models were constructed, one for mathematics scores and one for science scores in PISA-2012. The interval variable of the percentage of students with at least one parent with higher education was used as an indicator of school composition. Since measurement of the compositional effect required adding individual SES and prior attainment to the model, these parameters were used as control variables along with the other covariates. TIMSS scores in mathematics and science had been attained by students before the 9th grade, so they could serve as an indicator of prior achievement for the respective subjects in PISA-2012. A random intercept fixed slope model was applied to assess the compositional effect. Explained proportion of the variance was estimated using the formula proposed by Tom A. B. Snijders and Roel J. Bosker [Snijders, Bosker 1994]. Regression models of the first and second levels looked as follows:

(1) $Y_{ij} = \beta_{0j} + B_1 \times (\text{individual characteristics})_{ij} + \varepsilon_{ij}$,

where Y_{ij} is the i-th student's PISA-2012 score of school j in mathematics or science; β_{0j} is school's mean PISA-2012 score, unrelated to the covariates included in the model; B_1 is regression coefficients reflecting the relationship between students' individual characteristics and their PISA-2012 performance; and ε_{ij} is level 1 residual.

(2) $\beta_{0j} = Y_{00} + C_{01} \times (\text{school characteristics})_j + \mu_{0j}$,

where β_{0j} is the same as in (1); Y_{00} is mean PISA-2012 score in the school sample; C_{01} is regression coefficients reflecting the relationship between school characteristics and PISA-2012 performance; and μ_{0j} is level 2 residual.

Next, the propensity score matching (PSM) method was applied. The basic idea of the matching method consists in finding, for each observation in the treatment group (low-SEC school students), statistical "twins" in the control group (high-SEC school students), i. e. students who are as similar as possible in their observable characteristics. The method is used to balance the sample by partially solving the problem of self-selection into high- and low-SEC schools and to measure the achievement gap based on observations that only differ in the type of school. Performance disparities in the matched sample will show the compositional effect that is unrelated to the individual and school characteristics included in the model.

Matching begins with selecting the covariates—the variables that will be used to find similar observations. There are various strategies and no uniform procedure for covariate selection. One of the widely used strategies consists in selecting variables that demonstrate a significant correlation with the dependent variable even if they are not related to the distribution between the control and treatment groups. Inclusion of factors associated with distribution into groups alone may increase the standard error of the variable of interest [Cuong 2013]. Being enrolled in a school with a certain SEC by the 9th grade—that is, distribution into groups—can be determined by initial school choice or school change before the 8th grade. School choice may be affected, in some way or another, by family's socioeconomic status, place of residence, ethnicity, student's abilities, and the type and ethnic composition of the school. Academic achievement (separately in mathematics and science) may be related to all the control variables used at the previous stage of analysis. According to the strategy adopted, the final set of covariates contained the following characteristics that were significantly related to academic achievement and distribution into groups: gender, age, family SES, prior attainment, and school size.

Further matching, with due regard for the variables selected, was carried out by constructing a logistic regression model reflecting the likelihood of a student being assigned to the treatment group based on that student's covariate information, and by calculating the propensity score (PS). Similar observations were found using the methods of radius matching and Mahalanobis distance matching [Guo, Fraser 2014]. Covariate balance after matching was assessed using *t*-tests that measured differences between the control group and the treatment group before and after matching. *T*-test was also used to measure the effect of attending a low-SEC school as compared to attending a high-SEC school (average treatment effect on the treated) in the matched sample.

2. Results

2.1. Assessing the relationship between school SEC and academic achievement

Russian schools differ quite markedly in their socioeconomic composition (Figure 1). The indicator of school composition (percentage of students with at least one parent with higher education) is on aver-

Figure 1. **Socioeconomic composition of Russian schools, based on TIMSS-2011**

Percentage of students with at least one college-educated parent
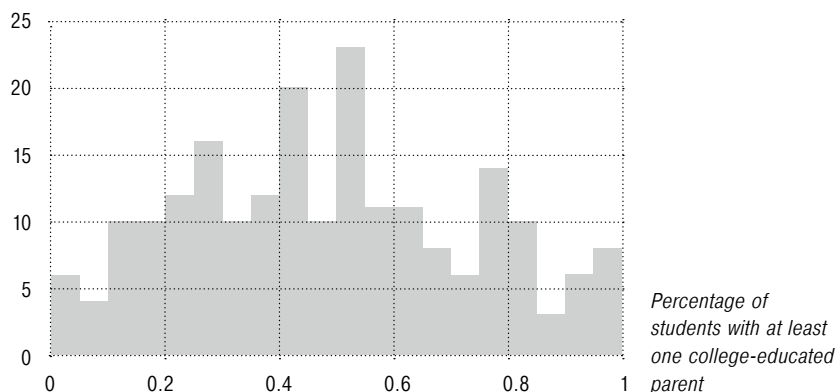
age 48% across 210 educational institutions, ranging from 40 to 60% for most schools. Meanwhile, it exceeds 95% in eight schools, and six institutions have no high-SES students at all.

Regression analysis shows that, despite a considerable variation in scores at the individual level, the distribution of students among schools explains 38 to 41% of the variance in PISA-2012 performance (Table 1). Nearly half of the differences in academic achievement can be explained by student's belonging to a particular type of educational institution. The variance patterns in Russia are similar to those reported in international literature.

The next models also included control variables but made no allowance for previous-year achievement. TIMSS-2011 scores in mathematics and science were added to the last two models. Using the indicator of prior attainment in the subject improves the model quality significantly, percentages of explained variance reaching 55% in mathematics and 50% in science. Meanwhile, the effects of other student and school characteristics on academic achievement become noticeably weaker for all parameters.

The positive correlation between school SEC and PISA performance in mathematics shrinks almost twice when previous-year TIMSS scores are added to the model. Nevertheless, school composition remains a significant characteristic in both subjects, being related to academic performance stronger than any other school or individual factor. On average, a 25% increase in school SEC improves PISA-2012 performance by 58 score points in mathematics and by 53 points in science. Schools SD in students SES was found to be insignificant: homogeneity has no impact on success in either of the two subjects. In addition, territorial inequality becomes insignificant or changes the direction of correlation when school composition is controlled for.

Table 1. **Results of multilevel regression modelling of relationship between school SEC and PISA-2012 performance in mathematics and science**

	PISA-2012 mathematics			PISA-2012 science		
Gender (1—female)		−0.13*** (0.03)	−0.10*** (0.02)		−0.04 (0.03)	0.05** (0.02)
Age		−0.07*** (0.02)	−0.04*** (0.01)		−0.07*** (0.02)	−0.06*** (0.01)
Ethnicity (1—always speaking Russian at home)		0.06 (0.05)	0.05 (0.04)		0.07 (0.05)	0.03 (0.04)
Socioeconomic status (1—at least one parent with degree)		0.21*** (0.03)	0.07*** (0.02)		0.23*** (0.03)	0.07*** (0.02)
TIMSS-2011			0.65*** (0.02)			0.61*** (0.02)
Socioeconomic composition		1.25*** (0.18)	0.71*** (0.14)		1.09*** (0.19)	0.68*** (0.15)
SEC SD		−0.80** (0.37)	0.07 (0.31)		−0.71* (0.38)	0.04 (0.3)
City (1—over 100,000 inhabitants)		−0.12 (0.1)	−0.20** (0.08)		−0.04 (0.1)	−0.08 (0.08)
Town (1—15,000 to 100,000 inhabitants)		0.02 (0.12)	−0.08 (0.08)		0.05 (0.12)	0.00 (0.09)
School type (1—gymnasiums, regular schools offering gymnasium classes, specialized schools)		0.18*** (0.05)	0.04 (0.03)		0.16*** (0.05)	0.03 (0.03)
School size		0.02 (0.05)	0.06* (0.03)		−0.02 (0.05)	0.02 (0.03)
Ethnic composition		0.02 (0.04)	0.02 (0.03)		0.10** (0.05)	0.06* (0.04)
Constant	−0.06 (0.05)		−0.28* (0.17)	−0.06 (0.04)	−0.40* (0.23)	−0.40** (0.19)
Between-group variance	0.41		0.12	0.38	0.20	0.14
Within-group variance	0.59		0.32	0.62	0.58	0.35
ICC	0.41		0.28	0.38	0.26	0.28
R^2 (Level 1)			0.55		0.19	0.50
R^2 (Level 2)			0.66		0.39	0.60
Number of students	4,399		2,963	4,399	2,963	2,963
Number of schools	208		205	208	205	205

Note: Standard errors of measurement in parentheses. All interval variables (including the dependent variable) are standardized. Confidence level—*90%; **95%; ***99%.

Figure 2. **Characteristics of low- and high-SEC schools**, %

City	26 / 70		Low SEC / High SEC
Town	14 / 20		
Rural settlement	60 / 10		
School type	12 / 60		
Ethnic composition	81 / 82		
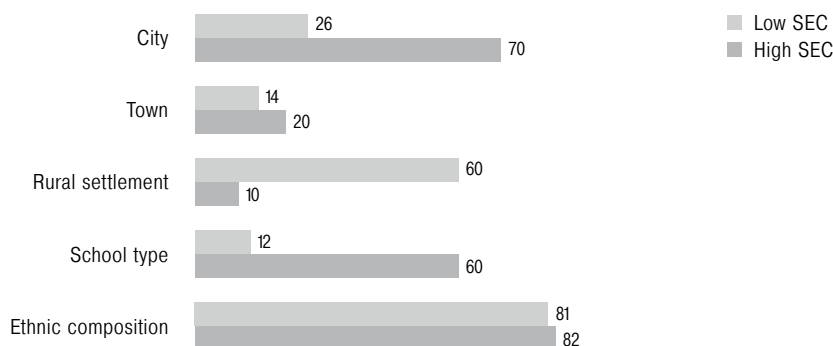
Figure 3. **Academic achievement of students attending high- vs. low-SEC schools**

TIMSS mathematics	517 / 569		Low SEC / High SEC
TIMSS science	525 / 567		
PISA mathematics	459 / 524		
PISA science	458 / 517		
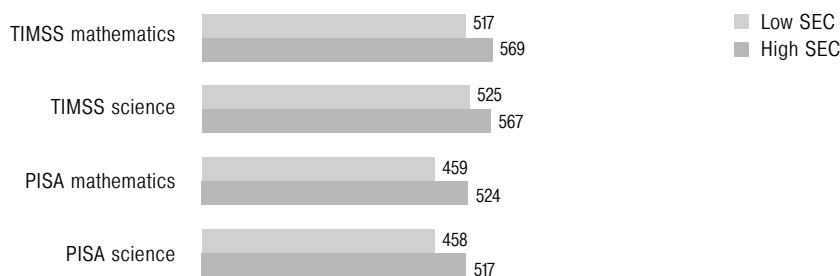
2.2. Comparing the effect of one year of attending a low- vs. high-SEC school by propensity score matching

To compare the independent contribution of school SEC to academic achievement, a matched sample was formed from the bottom 40% and the top 40% of the distribution of schools by the percentage of students with at least one parent with degree. The database contained 85 low-SEC schools and 83 high-SEC schools (Appendix 1). The percentage of students with educated parents in these two groups was on average 23 and 74%, respectively. Apart from the socioeconomic status of students, schools with different SEC in Russia also differ in location and type (percentage of gymnasiums and regular schools offering gymnasium classes) (Figure 2).

There are clear disparities in academic achievement between low- and high-SEC schools (Figure 3), the gaps in PISA scores between students in different types of schools being wider than those in TIMSS performance. On the whole, this supports the hypothesis that PISA correlates stronger than TIMSS with student SES. Anyhow, the difference in scores is significant for both assessments.

Figure 4. **Mean PISA-2012 mathematics scores of students from low- and high-SEC schools before and after sample matching**
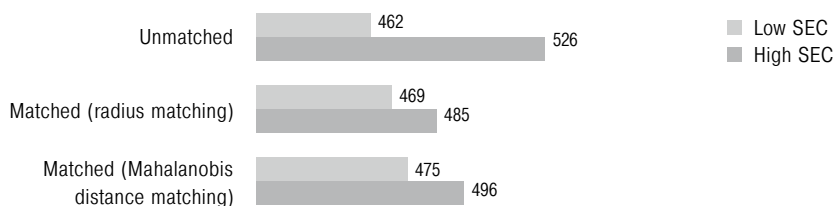
Figure 5. **Mean PISA-2012 science scores of students from low- and high-SEC schools before and after sample matching**
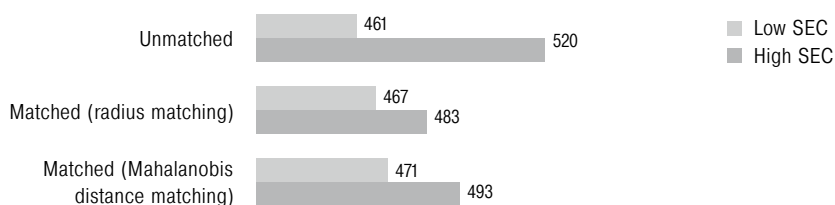
The PSM method was applied to answer the main research question. The final sample was composed of ninth-graders with similar characteristics enrolled in different types of schools. Depending on the exact method, selection resulted in matched pairs for 2,587 and 2,810 students in mathematics and for 2,851 and 2,586 students in science. In each case, there were no significant differences in the individual characteristics of students from different types of schools (Appendices 2, 3, 4, and 5).

In the matched samples, whichever method was used, the gap in PISA-2012 mathematics performance (Figure 4) at the end of the 9th grade between students from low- and high-SEC schools is reduced dramatically. Still, the difference remains statistically significant (t= −3.09 and p<0.01; t= −4.41 and p<0.01). For students with similar observable characteristics, one year of attending a low-SEC school results in an average decrease in mathematics performance by 0.23 SD, or 19 score points.

Similar results were obtained for academic achievement in science (Figure 5). In both subjects, attending a low-SEC school as a ninth-grader has a negative impact on academic performance regardless of student characteristics (t= −2.87 and p<0.01; t= −4.19 and p<0.01). PISA-2012 science scores obtained by students in low-SEC schools were 0.25 SD, or 19 score points, lower than the scores of students who spent their 9th grade in high-SEC schools.

3. Limitations   This study has a few important limitations, primarily concerning the data and the method.

First, analysis of compositional effects requires quite a wide range of data. Ideally, assessment of prior attainment would imply using an indicator of student performance at the very baseline or before being enrolled in a particular school. When the longitudinal study started in 2011, students were already enrolled in the 8th grade. Their TIMSS scores in mathematics were largely explained by the educational institution itself and could not be considered as a pure indicator of student ability, which depended on individual characteristics only. Furthermore, TIMSS and PISA differ in content. Strictly speaking, their results cannot be used as a single indicator measured at different times. The present study makes an assumption that there are similarities between the two tests and that their scores may be used as comparable indicators of student achievement to a certain extent. Finally, assessment of school composition in this study is restricted to one cohort of students. More reliable within-school analyses will require data on the socioeconomic status of every single student enrolled. These limitations narrow the interpretation down to assessing the effect of only one year of attending schools of different types on the academic success of only one cohort of students.

Second, PSM is a quasi-experimental method, applied only as an attempt to bring the conditions closer to the gold standard for causal inference. Only measurable student and school characteristics can be used for sample matching. It is not impossible that there were no disparities in unobservable characteristics between the students of high- and low-SEC schools in the matched sample. Therefore, inferences were made about the compositional effect that was at least unrelated to the analyzed student and school characteristics, which are key factors of academic achievement.

Third, this study lacks analysis on the reading subject or Russian language, which prevents any inferences about the universal effect of school SEC on academic achievement. Assessment of the impact on other subjects could possibly add insight to the findings of this paper.

4. Conclusion   • School socioeconomic composition is one of the most powerful factors of academic achievement, compared to other individual and school characteristics.
• Low school SEC makes an independent negative contribution (up to 0.25 SD) to mathematics and science achievement.
• Earlier studies that did not use quasi-experimental designs tend to overestimate the impact of SEC by at least one third.
• SEC-related disparities in academic achievement cannot be fully explained by school location.

Analysis results show that school SEC is an independent factor contributing to inequality of educational outcomes in Russia. The influence of school SEC on academic achievement in mathematics and science is stronger than that of any other school or individual characteristic. Even previous-year achievement is related weaker to performance, regression analysis shows.

Quasi-experiments also confirm the significant effect of school composition. Children of the same gender and age with similar levels of performance and socioeconomic status, attending schools of comparable size, differ in their progress by the end of the 9th grade if they get into schools of different SEC. In a year, a student attending a low-SEC school will perform on average a quarter of SD lower in PISA than a student attending a high-SEC school. That is, Russian students with comparable levels of ability differ in their opportunity to succeed, which is determined by a school parameter over which they have no control. The effect differs little across the subjects, which may indicate the universality of school SEC impact on academic achievement in general.

The effect measured in multilevel regression analysis is nearly three times higher than the one obtained by a quasi-experiment. However, it is significant in both cases. Even though earlier studies in the field that did not use quasi-experimental designs tend to overestimate the role of the compositional effect quite considerably, they still make valid inferences about the contribution of this indicator unrelated to individual student characteristics. Meanwhile, where the compositional effect derives from remains unclear. Presumably, the causes may be rooted in the content and organization of learning, as well as school resources, teacher characteristics, teaching practices, and peer effects [Danhier 2016; Demanet, Houtte 2011; Opdenakker, Damme 2001; Perry 2012; Hanushek et al. 2003; Palardy 2014].

In the recent years, Russia has been retaining a medium level of school socioeconomic segregation [Kosaretsky, Froumin 2019]. Concentration of disadvantaged students in the same schools may set off the negative effects of low school SEC. This may affect institutions that have never been a concern before: socioeconomic composition can be low in well-resourced schools and schools located in cities or good neighborhoods. Selective support of such schools requires further investigation into the genesis of the compositional effect and a detailed analysis of learning environment components that contribute to the reproduction of inequality through school socioeconomic composition.

Appendix   A1. **Descriptive Statistics**

	All schools			Low SEC			High SEC		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
Student characteristics									
Gender	4,893	49%	50%	1,561	48%	50%	2,313	50%	50%
Ethnicity	4,886	83%	37%	1,559	82%	38%	2,309	83%	38%
Age	4,893	14.74	0.47	1,561	14.77	0.51	2,313	14.70	0.44
SES	4,372	0.53	0.50	1,356	0.25	0.43	2,128	0.74	0.44
TIMSS mathematics	4,893	538.98	78.28	1,561	517.09	69.19	2,313	569.29	77.90
TIMSS science	4,893	542.46	72.78	1,561	525.02	67.63	2,313	566.82	72.49
PISA mathematics	4,399	492.22	81.54	1,431	459.11	72.51	2,068	523.65	78.27
PISA science	4,399	488.97	78.02	1,431	458.04	71.03	2,068	516.97	76.33
School characteristics									
School size	207	628.37	375.55	83	437.47	317.32	82	816.93	357.35
City	210	48%	50%	85	26%	44%	83	70%	46%
Town	210	20%	40%	85	14%	35%	83	20%	41%
Rural settlement	210	32%	47%	85	60%	49%	83	10%	30%
School type	148	33%	47%	57	12%	33%	60	60%	49%
Ethnic composition	210	83%	24%	85	81%	29%	83	82%	21%
SEC	210	48%	25%	85	23%	11%	83	74%	14%
SEC SD	210	43%	12%	85	40%	13%	83	41%	12%

A2. **PSM results for PISA-2012 scores in mathematics** (radius matching: caliper=0.004)
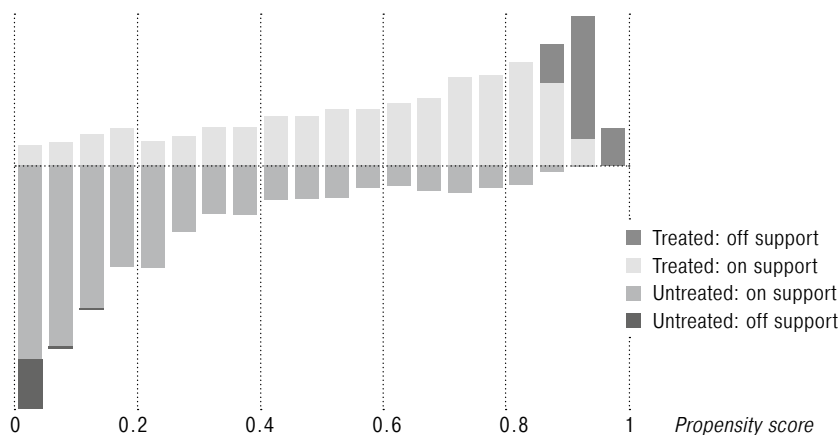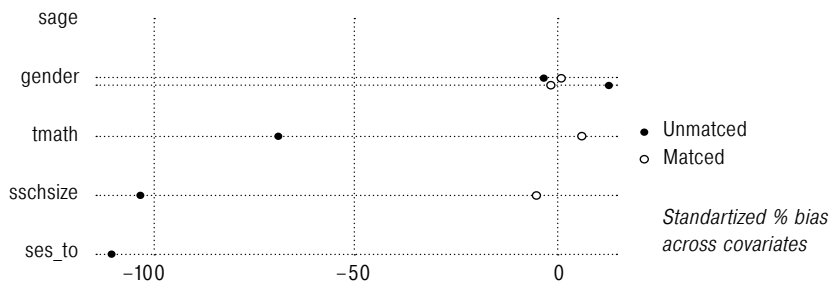
Standartized % bias across covariates

Variable	Matched/ unmatched	Mean: treatment group	Mean: control group	t	p > |t|
Gender	Unmatched	0.49753	0.5146	−0.93	0.354
	Matched	0.50842	0.50446	0.18	0.859
Age	Unmatched	0.01845	−0.10417	3.38	0.001
	Matched	−0.01836	−0.00078	−0.39	0.694
SES	Unmatched	0.24959	0.73128	−29.79	0.000
	Matched	0.3003	0.28543	0.73	0.463
TIMSS-2011	Unmatched	−0.29077	0.36175	−18.84	0.000
	Matched	−0.14502	−0.19828	1.28	0.200
School size	Unmatched	−0.52933	0.41776	−27.82	0.000
	Matched	−0.35715	−0.30585	−1.46	0.144

A3. **PSM results for PISA-2012 scores in mathematics**
(Mahalanobis distance matching, caliper = 0.2)

	Off support	On support	Total
Comparison group	0	1,883	1,883
Treatment group	510	704	1,214
Total	510	2,587	3,097
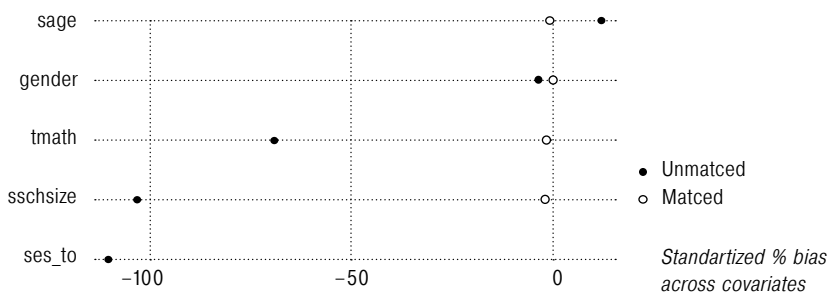
Standartized % bias across covariates

Variable	Matched/ unmatched	Mean: treatment group	Mean: control group	t	$p > \lvert t \rvert$
Gender	Unmatched	0.49753	0.5146	−0.93	0.354
	Matched	0.50568	0.50568	−0.00	1.000
Age	Unmatched	0.01845	−0.10417	3.38	0.001
	Matched	0.02943	0.03147	−0.05	0.961
SES	Unmatched	0.24959	0.73128	−29.79	0.000
	Matched	0.3125	0.3125	0.00	1.000
TIMSS-2011	Unmatched	−0.29077	0.36175	−18.84	0.000
	Matched	−0.03267	−0.0178	−0.36	0.722
School size	Unmatched	−0.52933	0.41776	−27.82	0.000
	Matched	−0.28537	−0.27092	−0.36	0.716

A4. **PSM results for PISA-2012 scores in science**
(radius matching: caliper = 0.005)

Treated: off support
Treated: on support
Untreated: on support
Untreated: off support

Propensity score

Unmatced
Matced

Standartized % bias across covariates

Variable	Matched/ unmatched	Mean: treatment group	Mean: control group	t	$p > \|t\|$
Gender	Unmatched	0.49753	0.5146	−0.93	0.354
	Matched	0.50213	0.50213	0.00	1.000
Age	Unmatched	0.01845	−0.10417	3.38	0.001
	Matched	0.04677	0.05901	−0.29	0.769
SES	Unmatched	0.24959	0.73128	−29.79	0.000
	Matched	0.30156	0.30156	−0.00	1.000
TIMSS-2011	Unmatched	−0.23932	0.32676	−15.97	0.000
	Matched	−0.02749	−0.00544	−0.50	0.620
School size	Unmatched	−0.52933	0.41776	−27.82	0.000
	Matched	−0.27637	−0.25258	−0.59	0.554

A5. **PSM results for PISA-2012 scores in science**
(Mahalanobis distance matching, caliper = 0.2

	Off support	On support	Total
Comparison group	0	1,883	1,883
Treatment group	511	703	1,214
Total	511	2,586	3,097

Standartized % bias across covariates

Variable	Matched/ unmatched	Mean: treatment group	Mean: control group	t	$p > \|t\|$
Gender	Unmatched	0,49753	0,5146	−0,93	0,354
	Matched	0,50213	0,50213	0,00	1,000
Age	Unmatched	0,01845	−0,10417	3,38	0,001
	Matched	0,04677	0,05901	−0,29	0,769
SES	Unmatched	0,24959	0,73128	−29,79	0,000
	Matched	0,30156	0,30156	−0,00	1,000
TIMSS-2011	Unmatched	−0,23932	0,32676	−15,97	0,000
	Matched	−0,02749	−0,00544	−0,50	0,620
School size	Unmatched	−0,52933	0,41776	−27,82	0,000
	Matched	−0,27637	−0,25258	−0,59	0,554

References
Agirdag O. (2018) The Impact of School SES Composition on Science Achievement and Achievement Growth: Mediating Role of Teachers' Teachability Culture. *Educational Research and Evaluation*, vol. 24, no 3–5, pp. 264–276.

Aiyar S., Ebeke C. (2019) *Inequality of Opportunity, Inequality of Income and Economic Growth*. Washington D. C.: International Monetary Fund.

Amini C., Nivorozhkin E. (2015) The Urban–Rural Divide in Educational Outcomes: Evidence from Russia. *International Journal of Educational Development*, vol. 44, iss. C, pp. 118–133.

Armor D. J., Marks G. N., Malatinszky A. (2018) The Impact of School SES on Student Achievement: Evidence from U. S. Statewide Achievement Data. *Educational Evaluation and Policy Analysis*, vol. 40, no 4, pp. 613–630.

Bartholo T. L., Costa M. da (2016) Evidence of a School Composition Effect in Rio de Janeiro Public Schools. *Avaliação e Políticas Públicas em Educação*, vol. 24, no 92, pp. 498–521.

Belfi B., Goos M., Pinxten M., Verhaeghe J. P., Gielen S., De Fraine B., Van Damme J. (2014) Inequality in Language Achievement Growth? An Investigation into the Impact of Pupil Socio-Ethnic Background and School Socio-Ethnic Composition. *British Educational Research Journal*, vol. 40, no 5, pp. 820–846.

Belfi B., Haelermans C., De Fraine B. (2016) The Long-Term Differential Achievement Effects of School Socioeconomic Composition in Primary Education: A Propensity Score Matching Approach. *British Journal of Educational Psychology*, vol. 86, no 4, pp. 501–525.

Blossfeld H. P., Buchholz S., Skopek J., Triventi M. (2016) *Models of Secondary Education and Social Inequality: An International Comparison*. Cheltenham, Gloucestershire: Edward Elgar.

Boonen T., Speybroeck S., De Bilde J., Lamote C., Van Damme J., Onghena P. (2014) Does It Matter Who Your Schoolmates Are? An Investigation of the Association between School Composition, School Processes and Mathematics Achievement in the Early Years of Primary Education. *British Educational Research Journal*, vol. 40, no 3, pp. 441–466.

Borman G. D., Dowling M. (2010) Schools and Inequality: A Multilevel Analysis of Coleman's Equality of Educational Opportunity Data. *Teachers College Record*, vol. 112, no 5, pp. 1201–1246.

Brunner M., Keller U., Wenger M., Fischbach A., Lüdtke O. (2018) Between-School Variation in Students' Achievement, Motivation, Affect, and Learning Strategies: Results from 81 Countries for Planning Group-Randomized Trials in Education. *Journal of Research on Educational Effectiveness*, vol. 11, no 3, pp. 452–478.

Buckingham J., Wheldall K., Beaman-Wheldall R. (2013) Why Poor Children are More Likely to Become Poor Readers: The School Years. *Australian Journal of Education*, no 3, pp. 190–213.

Chesters J., Daly A. (2017) Do Peer Effects Mediate the Association Between Family Socio-economic Status and Educational Achievement? *Australian Journal of Social Issues*, vol. 52, no 1, pp. 63–77.

Coleman J. S. (1966) *Equality of Educational Opportunity Study*. Washington, DC: US Department of Health, Education, and Welfare, Office of Education.

Condron D. J. (2009) Social Class, School and Non-School Environments, and Black/White Inequalities in Children's Learning. *American Sociological Review*, no 5, pp. 683–708.

Condron D. J., Downey D. B. (2016) Fifty Years since the Coleman Report: Rethinking the Relationship between Schools and Inequality. *Sociology of Education*, vol. 89, no 3, pp. 207–220.

Cuong N. V. (2013) Which Covariates Should Be Controlled in Propensity Score Matching? Evidence from a Simulation Study. *STAN Statistica Neerlandica*, vol. 67, no 2, pp. 169–180.

Danhier J. (2017) How Big is the Handicap for Disadvantaged Pupils in Segregated Schooling Systems? *British Journal of Educational Studies*, vol. 66, no 3, pp. 341–364.

Danhier J. (2016) Teachers in Schools with Low Socioeconomic Composition: Are They Really that Different? *European Education*, vol. 48, no 4, pp. 274–293.

Demanet J., Houtte M. V. (2011) Social-Ethnic School Composition and School Misconduct: Does Sense of Futility Clarify the Picture? *Sociological Spectrum*, vol. 31, no 2, pp. 224–256.

Duncan G. J., Murnane R. J. (2011) *Whither Opportunity? Rising Inequality, Schools and Children's Life Chances*. New York: Russell Sage Foundation.

Esping-Andersen G. (2015) Welfare Regimes and Social Stratification. *Journal of European Social Policy*, vol. 25, no 1, pp. 124–134.

Field S., Kuczera M., Pont B. (2007) *No More Failures. Ten Steps to Equity in Education. Summary and Policy Recommendations*. Paris: OECD.

Flouri E., Midouhas E. (2016) School Composition, Family Poverty and Child Behaviour. *Social Psychiatry and Psychiatric Epidemiology*, vol. 51, no 6, pp. 817–826.

Froumin I., Pinskaya M., Kosaretsky S. (2012) Sotsialno-ekonomicheskoe i territorialnoe neravenstvo uchenikov i shkol [Socio-Economic and Territorial Inequality of Students and Schools]. *Narodnoe obrazovanie*, no 1, pp. 17–24.

Guo S., Fraser M. W. (2014) *Propensity Score Analysis: Statistical Methods and Applications*. Vol. 11. Thousand Oaks, CA: SAGE.

Hanushek E. A., Kain J. F., Markman J. M., Rivkin S. G. (2003) Does Peer Ability Affect Student Achievement? *Journal of Applied Econometrics*, vol. 18, no 5, pp. 527–544.

Harker R., Tymms P. (2004) The Effects of Student Composition on School Outcomes. *School Effectiveness and School Improvement*, vol. 15, no 2, pp. 177–199.

Kapuza A., Kersha Y., Zakharov A., Khavenson T. (2017) Obrazovatelnye rezultaty i sotsialnoe neravenstvo v Rossii: dinamika i svyaz s obrazovatelnoy politikoy [Educational Attainment and Social Inequality in Russia: Dynamics and Correlations with Education Policies]. *Voprosy obrazovaniya / Educational Studies Moscow*, no 4, pp. 10–35. DOI: 10.17323/1814–9545–2017–4–10–35

Khavenson T., Chirkina T. (2018) Effektivno podderzhivaemoe neravenstvo. Vybor obrazovatelnoy traektorii posle odinnadtsatogo klassa shkoly v Rossii [Effectively Maintained Inequality. The Choice of Postsecondary Educational Trajectory in Russia]. *Journal of Economic Sociology*, vol. 19, no 5, pp. 66–89.

Konstantinovskiy D. (2010) Neravenstvo v sfere obrazovaniya: rossiyskaya situatsiya [Inequality in Education: Situation in Russia]. *Monitoring of Public Opinion: Economic and Social Changes*, no 5(99), pp. 40–65.

Konstantinovskiy D., Kurakin D., Roshchina Y., Vahshtajn V. (2006) Dostupnost kachestvennogo obshchego obrazovaniya v Rossii: vozmozhnosti i ogranicheniya [The accessibility of quality education in Russia: opportunities and restrictions]. *Voprosy obrazovaniya / Educational Studies Moscow*, no 2, pp. 186–202.

Kosaretsky S., Froumin I. (eds) *Rossiyskaya shkola: nachalo XXI veka* [Russian School: The Beginning of the XXI Century]. Moscow: HSE.

Kosaretsky S., Grunicheva I., Pinskaya M. (2014) *School System and Educational Policy in a Highly Stratified Post-Soviet Society: The Importance of Social Context. Higher School of Economics Research Paper No WP BRP 22/PA/2014*. Moscow: HSE.

Kosyakova Yu., Yastrebov G., Yanbarisova D., Kurakin D. (2016) Vosproizvodst-vo sotsialnogo neravenstva v rossiyskoy obrazovatelnoy sisteme [The Reproduction of Social Inequality in the Russian Educational System]. *Zhurnal Sotsiologii i Sotsialnoy Antropologii / The Journal of Sociology and Social Anthropology*, vol. 19, no 5, pp. 76–97.

Langenkamp A. G., Carbonaro W. (2018) How School Socioeconomic Status Affects Achievement Growth across School Transitions in Early Educational Careers. *Sociology of Education*, vol. 91, no 4, pp. 358–378.

Marks G. N. (2015) Are School-SES Effects Statistical Artefacts? Evidence from Longitudinal Population Data. *Oxford Review of Education*, vol. 41, no 1, pp. 122–144.

Murnane R. J., Willett J. B. (2011) *Methods Matter: Improving Causal Inference in Educational and Social Science Research.* Oxford; New York: Oxford University.

McCoy S., Quail A., Smyth E. (2014) The Effects of School Social Mix: Unpacking the Differences. *Irish Educational Studies*, vol. 33, no 3, pp. 307–330.

Niu S. X., Tienda M. (2013) High School Economic Composition and College Persistence. *Research in Higher Education*, vol. 54, no 1, pp. 30–62.

OECD (2018) *Equity in Education Breaking Down Barriers to Social Mobility*. Paris: OECD.

Opdenakker M.-C, Damme J. V. (2007) Do School Context, Student Composition and School Leadership Affect School Practice and Outcomes in Secondary Education? *British Educational Research Journal*, vol. 33, no 2, pp. 179–206.

Opdenakker M.-C., Damme J. V. (2001) Relationship between School Composition and Characteristics of School Process and their Effect on Mathematics Achievement. *British Educational Research Journal*, vol. 27, no 4, pp. 407–432.

Oppedisano V., Turati G. (2015) What Are the Causes of Educational Inequality and of Its Evolution over Time in Europe? Evidence from PISA. *Education Economics*, vol. 23, no 1, pp. 3–24.

Palardy G. J. (2014) High School Socioeconomic Composition and College Choice: Multilevel Mediation via Organizational Habitus, School Practices, Peer and Staff Attitudes. *School Effectiveness and School Improvement*, vol. 26, no 3, pp. 329–353.

Palardy G. J. (2013) High School Socioeconomic Segregation and Student Attainment. *American Educational Research Journal*, vol. 50, no 4, pp. 714–754.

Palardy G. J., Rumberger R. W., Butler T. (2015) The Effect of High School Socioeconomic, Racial, and Linguistic Segregation on Academic Performance and School Behaviors. *Teachers College Record*, vol. 117, no 12, pp. 1–52.

Perry L. B. (2012) What Do We Know about the Causes and Effects of School Socio-Economic Composition? A Review of the Literature. *Sport Education and Society*, vol. 30, no 1, pp. 19–35.

Perry L. B., McConney A. (2010) Does the SES of the School Matter? An Examination of Socioeconomic Status and Student Achievement Using PISA 2003. *Teachers College Record*, vol. 112, no 4, pp. 1137–1162.

Rjosk C., Richter D., Hochweber J., Lüdtke O., Klieme E., Stanat P. (2014) Socioeconomic and Language Minority Classroom Composition and Individual Reading Achievement: The Mediating Role of Instructional Quality. *Learning and Instruction*, vol. 32, iss. 1, pp. 63–72.

Sirin S. R. (2005) Socioeconomic Status and Academic Achievement: A Meta-Analytic Review of Research. *Review of Educational Research*, vol. 75, no 3, pp. 417–453.

Snijders T., Bosker R. (1994) Modeled Variance in Two-Level Models. *Sociological Methods &Research*, vol. 22, no 3, pp. 342–363.

Televantou I., Marsh H.W., Kyriakides L., Nagengast B., Fletcher J., Malmberg L.-E. (2015) Phantom Effects in School Composition Research: Consequences of Failure to Control Biases due to Measurement Error in Traditional Multilevel Models. *School Effectiveness and School Improvement*, vol. 26, no 1, pp. 75–101.

Thrupp M. (1995) The School Mix Effect: The History of an Enduring Problem in Educational Research, Policy and Practice. *British Journal of Sociology of Education*, vol. 16, no 2, pp. 183–203.

World Economic Forum (2020) The Global Social Mobility Report 2020: Equality, Opportunity and a New Economic Imperative. Available at: http://www3.weforum.org/docs/Global_Social_Mobility_Report.pdf (accessed 24 September 2020).

World Economic Forum (2019) *Global Competitiveness Report 2019.* Available at: http://www.cdi.org.pe/pdf/IGC/2019/WEF_TheGlobalCompetitivenessReport2019.pdf (accessed 24 September 2020).

Yastrebov G., Bessudnov A., Pinskaya M., Kosaretsky S. (2014) *Contextualizing Academic Performance in Russian Schools: School Characteristics, the Composition of Student Body and Local Deprivation*. Available at: https://publications.hse.ru/preprints/138702408 (accessed 24 September 2020).

Greenfield Projects in the Higher Education Ecosystem:
The Case of BS BRICS

D. Savkin, E. Loktionova, D. Khlebovich

Dmitry Savkin
Candidate of Sciences in Political Science, Vice-Rector for International Affairs, Irkutsk National Research Technical University (INRTU); Head of BS BRICS, INRTU. Email: d.savkin@mail.ru
Elena Loktionova
Candidate of Sciences in Economics, Senior Researcher, BS BRICS, Irkutsk National Research Technical University (INRTU). Email: loktionova_ea@mail.ru
Daria Khlebovich
Candidate of Sciences in Economics, Associate Professor, Deputy Head of BS BRICS, Irkutsk National Research Technical University (INRTU).
Email: daria.khlebovich@gmail.com

Address: 83 Lermontova St, 664074 Irkutsk, Russian Federation.

Abstract. The ideas of global education and changes in the educational paradigm have determined new paths for the evolution of higher education, which are based on the creation and use of educational innovations, and have led to the emergence of greenfield projects as a new education initiative. In this paper, we analyze the prerequisites and practices of greenfield-based modernization in Russia's higher education. Specifically, the study's goal is to elaborate on the role of greenfield projects in the transformation of the higher education ecosystem.

University is a key element of the education ecosystem, and its greenfield projects are drivers that foster education initiative and technology innovation, transform the ecosystem and create conditions for its further development.

The method of case study made it possible to analyze the mechanism of initiating change in a particular university, identify the specific development aspects of a local greenfield project, BS BRICS, and demonstrate its systemic influence not only on the university but also on the region as a whole.

Greenfield projects help universities engage actively in the formation of modern higher education landscape rather than just get passively integrated, thus extending the ecosystem's opportunities for collaborations and innovation funding.
Keywords: higher education, greenfield project, ecosystem, innovation, education initiative, BS BRICS.

New education initiatives are a key characteristic of today's higher education landscape in Russia. Their relevance is due to the fact that, to improve the quality standards in higher education and research without increasing government subsidies, universities must choose a way to preserve themselves as organizations, while remaining competitive

and committed to their own mission [Dim 2004]. As a solution, they normally integrate practices of varying degrees of novelty.

The academic community develops an increasing demand for efficient education initiatives that have already been embodied in some recent projects. The value of each successful practice is growing with the understanding that the existing universities need to be restructured and that the development trajectories as well as prior managerial decisions of Russian universities often come into conflict with the new context.

The purpose of this article is to show how university greenfield can become a driver of positive transformation and "a fundamentally new culture of human activity, which is the ability to create and implement innovations." [Zhuk 2014:66]. An exploration of new university practices in the structure of the higher education ecosystem will make it possible to project the dynamics and conditions of its further development. When assessing the higher education ecosystem, it is important to make allowance for the regional dimension to explain the specificity of university practices. Greenfield projects provide a new space for project development and implementation and foster competence-based competition, which is defined as ability to create new things by creative combination of skills and competencies [Sanchez, Heene 2004].

In a situation where Russia's higher education, regional universities in particular, is not yet competitive enough in the global market, greenfield projects represent a point of growth for the university. Today, they are considered as an option for ensuring quality education and as an impetus for driving the flow of motivated students in a new direction. In the long term, the effects of greenfield will spread to research and development and promote the expansion of international cooperation.

Problem Statement and Research Approaches

In present-day Russia, transformations in universities occur in such a way that "the share of new institutions is extremely small, and higher education has been modernized predominantly by developing the existing structures or reorganizing them by way of mergers and acquisitions."[1] The modern landscape of higher education is described in terms of the types and models of universities, their statuses, approaches and specializations. This adds even more value and worthiness of consideration to practices that mark the emergence of new institutions—they represent areas of growth in the face of limited funding, increasing competition and the ever more stringent requirements to meet the performance criteria.

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[1] How to Transform a University. Interview A. K. Klyuev with A.V. Sherbinka // University Management: Practice and Analysis. 2018. No 6. P. 5–7.

This study applies three theoretical approaches. The first one is Burton Clark's "triangle of coordination" [Clark 1983], which discriminates among three main forces coordinating changes in higher education: the state authority, the market and the academic oligarchy. Interactions among those forces result in the differentiation of higher education and the emergence of new leaders and success stories. Universities determine their development pathways in the context of institutional changes and external pressures [Knyazev, Drantusova 2012]. The second approach is the concept of ecosystem, which can be applied to higher education as an open system with a large number of actors and a variety of ties among them [Bertalanffy 1968]. This theory allows describing the evolution of new actors in the system, their relationships with the internal and external environment and their impact on the ecosystem as a whole. Finally, the third approach is the method of case study—defined as an empirical inquiry that investigates a contemporary phenomenon within its real-world context [Yin 2014]—which is used for analyzing the practices of specific organizations in a variety of sectors, including higher education [Zmiyak et al. 2019].

Higher Education Ecosystem: Determinants of Development

Conceived in the early 20th century, the term "ecosystem" was originally used to describe biological systems. Elaboration of Ludwig von Bertalanffy's idea of general laws governing biological and physical systems spiraled into proving the existence of general regularities and principles of performance and evolution across typologically dissimilar complex systems [Bertalanffy 1968; Simon 1972; Holland 1992]. Identification of the common properties of complex systems, as well as of a number of their performance and evolution characteristics makes it possible to apply an interdisciplinary approach to their analysis and expand the set of research tools [Foster, Wild 1996; Foster 2005].

In 1993, drawing analogies between biological and economic systems, James F. Moore introduced the concept of "business ecosystem" [Moore 1993; 1996] to describe the general structure of economic systems and the peculiarities of business processes, e. g. in competition or production and consumption of goods and services. The use of ecological metaphors turned out to be so productive that the term "ecosystem" began to be used to describe the principles of interactions between the elements of self-organizing, self-regulating and self-developing systems in such areas as innovation, information technology, medicine, education, urban studies, etc. [Townsend 2019]

The ecosystem approach began to be applied in education as a response to the increasing complexity and diversity of processes underlying the performance of education systems. The goals of sustainable development, the ideas of global education, new information technologies and the resulting change in the traditional structure of labor markets have led to a revision of educational purposes and traditional formats and methods of teaching, contributing to a shift in the

educational paradigm as such. As the model of open innovation was spreading and the role of education in innovative development was realized, the concepts of knowledge ecosystem [Shrivastava 1998] and innovation system [Edquist 1997; Lundvall 1992; Chesbrough 2003] emerged, their key element being universities successfully combining educational and research activities. In the light of new opportunities in the educational environment, the ecosystem approach has been applied to determine the directions for advancing universities' innovative and educational activities, to substantiate the specific directions and forms of interaction among university, business and the state, and to design innovative education programs [Grant 1998; Tomozii, Topala 2014; Golubev, Testov 2015; Fucuda 2020; Sigova, Serebryakov, Luksha 2013].

Studying the education system through the prism of interactions of its elements with one another and with the environment, the ecosystem approach allows broadening the scope of research, which now includes the entirety of education system and environment elements involved in interactions as well as the complex relations among them, including network ties. In research, the focus is shifted from the characteristics of individual system elements to relations among them and the specific aspects of their interactions. The number and nature of relations among the system elements determine the variety of possible options for their interactions with one another and the external environment. The more stable and diverse the relations, the more potential trajectories the system has for development and the more it is adaptive to changing conditions. In the context of increasingly complex and diversified processes underlying the performance of education systems, broadening the scope of research is imperative, since understanding the evolutionary mechanisms of educational ecosystems will contribute to promoting a new educational landscape that meets the needs of modern society and fosters innovation in national development.

Educational ecosystem is therefore an innovative socio-educational network that includes formal and informal educational institutions as well as all members of the community with their educational needs, has a variety of sources of funding, educational and other resources, and has a mission of promoting innovation in socioeconomic development [Trapitsin, Timchenko, Krokinskaya 2015; Bogdanov, Timchenko 2019; De Corte 2014]. Interactivity, modularity, consistency, variability, innovativeness and adaptability of the educational ecosystem [Fedorov 2019] make it a stable and effective element of the sociocultural environment.

University is a key element of the educational ecosystem, serving as a platform for achieving the goals of socioeconomic development and as the foundation of knowledge-based society. Universities are expected to become innovation hubs through encouraging research and development, responding promptly to society's needs, offering

innovative education programs, implementing modern technology and advanced methods in teaching and management, and ensuring a transfer of knowledge and technology as part of cooperation with the business community. Educational ecosystems are characterized by a network structure and distributed management carried out by communities comprising the ecosystem, which allows them to respond promptly to students' needs and adapt to changes in the institutional environment [Kumar, Neerja 2017]. Interactions of the educational ecosystem elements with one another and the external environment give rise to such products as science parks, seed accelerators, business incubators and creative spaces for communication, helping universities determine their trajectories of innovation. Evolution of an ecosystem implies emergence of new elements that not only consolidate but also expand its role as an innovator.

According to experts, the upcoming "avalanche of innovation" is likely to seriously change the landscape of education across the globe.[2] A brighter future is no longer guaranteed for traditional academic institutions. There simply will not be enough resources for everyone. Education is thus confronted with an administrative challenge unprecedented in terms of both scale and complexity: the transformation of tens of thousands of "educational enterprises" whose activities benefit over 100 million people, and whose annual budgets are estimated to total in excess of $2.3 trillion in OECD countries alone.

Implementation of the ecosystem approach to the formation and development of an education system that contributes to national innovative growth has been exemplified remarkably in the case of the United States [Crowe, Debars 2017]. Transformation of the U.S. education system started in the first half of the 20th century, when some of the country's top universities focused their efforts on applied science, technology and innovation to ensure sustainable economic growth.

Russian universities exist in an institutional environment that has traditionally treated them as educational organizations. In such circumstances, universities can be a source of innovation in education, but not in business or technology. The existing system of funding did not stimulate competition either, which partly explains the resistance of Russian higher education to innovation in learning as such [Seroshtan, Ketova 2020; Marginson 2014]. A modern educational ecosystem could not be formed due to weakness of the links between higher education and research, and the growing need for innovation exposed the urgency of change.

Reforms in higher education designed to integrate education and science changed the terms of funding and the criteria for university performance assessment, thereby formally expanding the scope

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[2] Konanchuk D. Zelenye protiv korichnevykh [Green vs. Brown]. *BRICS. Business Magazine*. Available at: https://bricsmagazine.com/ru/articles/zelenye-protiv-korichnevyh

of universities' activities and putting scientific research on a par with teaching. One of the essential requirements for smooth operation of a higher education ecosystem is the so-called "event component, i. e. disturbing events that change the functional requirements of the ecosystem." [Flek, Ugnich 2018:154] The nature of disturbing events can have a significant impact on the system's response and its further trajectory of development. At the same time, researchers emphasize that "most Russian universities (especially engineering ones) have virtually no rationally acting 'disturbers of the peace', drivers of educational modernization," [Froumin, Dobryakova 2012:185] The created network of federal, national research and flagship universities performing the functions of centers for research and education was supposed to become the core of the global ecosystem of higher education [Arzhanova, Zhurakovsky, Vorov 2014; Zhurakovsky, Vorov 2015; Maksimova, Nikolaev, Byambatsogt 2018]. However, even universities meeting the strict selection criteria were not always able to ensure the development of local innovation-based educational ecosystems, lacking the knowledge and experience of interaction with other players. Coordination of effort never happened.

Because evolution of an ecosystem is reflected in the emergence of new elements and relations, as well as changes in the properties of the existing elements and ties among them, unlocking of the innovative potential of Russian universities and their full-fledged integration into the process of knowledge and technology development and transfer requires creating a new space for education initiatives, referred to as greenfield. Greenfield projects aimed at implementing fundamentally new ideas and setting up new institutions by way of creative combination of successful education initiatives become elements of the educational ecosystem that change its properties in response to urgent socioeconomic issues. Having an impact on numerous characteristics of the higher education ecosystem, greenfield thus becomes an endogenous factor of its development. It can encourage all players in the ecosystem to engage in a "closer and more fruitful cooperation and overcome the barriers of incompetence and ignorance." [Efimov, Lapteva, Rumyantsev 2019:52] Greenfield projects are beginning to take on the role of the major driver in the education of the future, becoming an element of the higher education ecosystem that ensures materialization of education initiatives and innovative technologies.

Greenfield:
Expanding
the Boundaries
of the Term

Greenfield is an interdisciplinary concept used in sectoral economics and project and strategic management. Stemming from Western theories and practices of development and redevelopment, it was originally used to denote a vacant area of land suitable for construction or conservation as a natural asset. In sectoral economics, greenfield refers to doing investment from scratch, and greenfield projects are associated with creating new infrastructure and production facilities.

In Western world, greenfield investments represent an alternative to such ways of investment as mergers and acquisitions, joint ventures or licensing agreements [Yemelyanov, Aksenov 2011; Davies, Desbordes, Ray 2018]. The theory of project management associates greenfield with startups, in particular construction of new plants in newly developed territories [Vozmilova, Volgina 2016] and development of mineral resources [Akopov 2012]. The concept of greenfield is also included in vocabularies of urban studies, economic geography, municipal governance and industrial management.

The "field-color approach" [Gornova, Mityagin 2019] is believed to be actively used today in various fields, primarily with regard to planning and development. Green is associated with freshness, novelty, environmental friendliness, something good and promising. Since the early 1990s, the term "greenfield" has also been used by researchers and practitioners in higher education.

An early example of greenfield in education can be found in the ideas of pragmatism and experimental teaching expressed by John Dewey at the turn of the 20th century, which paved the way for project-based and active learning [Tomina 2011]. One of the first modern greenfield projects in higher education, described in 1994 [Hanifin, Eagle, Ramirez 1994], implied creating a model for engineering education that combined fundamental knowledge and in-demand skills and was based on innovative pedagogy and diversified engineering practice. The project involved six universities and five industrial partners from various industries in the United States. The educational model implied development of competencies in such areas as (i) leadership and teamwork, (ii) ability to seek, understand and apply knowledge from a variety of traditional disciplines, (iii) deep understanding of products and processes, and (iv) broad understanding of the entire enterprise, including the impact of technological decisions on profits, society and the environment.

The authors understood that most of these competencies could not be taught through the traditional lecture style pedagogy. Traditional engineering programs predominantly focused on knowledge. The process of learning had to become more practice-oriented, and the curriculum had to be interdisciplinary, modular, network-based and team-oriented, focusing on industry demands and offering flexible learning pathways. This innovative curriculum became the new greenfield paradigm, which its developers believed to be an opportunity to operate free of the inertia in the education enterprise and respond to the changing needs of both its industrial and student customers.

Greenfield projects occupy a particular niche of the ecosystem [Moore 2006] and develop their products, services and activities to keep it running. Greenfield projects in education, emerging as a space for new education initiatives, are the educational ecosystem's way of responding to the changing environment. They transform the ecosystem, enriching it with new elements and fostering innovative growth.

Figure 1. **The way greenfield affects the development of the higher education ecosystem**
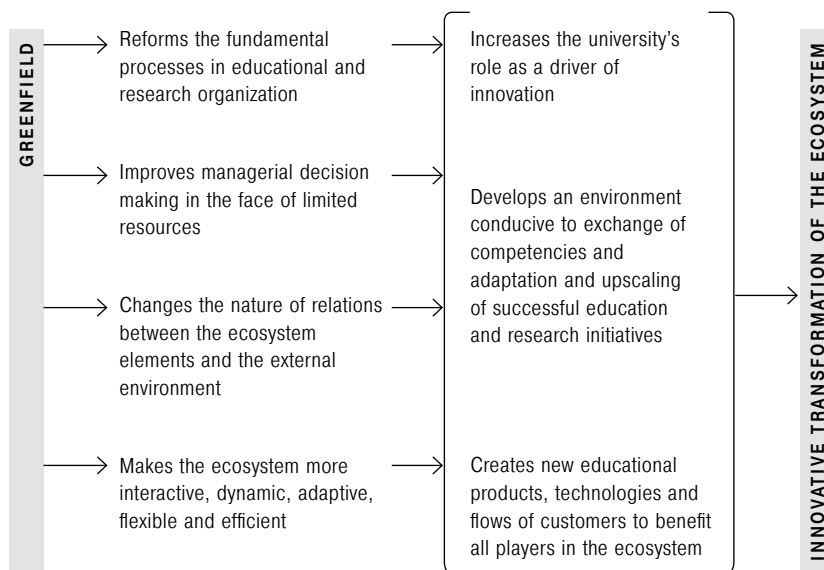

The main functions of greenfield in higher education ecosystems can be defined as follows:

1. Reform the fundamental processes in educational and research organization.
2. Improve managerial decision making in the face of limited resources.
3. Change the nature of relations between the ecosystem elements and the external environment.
4. Make the ecosystem more interactive, dynamic, adaptive, flexible and efficient.

This combination of functions determines the way greenfield affects the development of educational ecosystems (Figure 1). Performance of each function yields outcomes indicating an innovative transformation of the ecosystem. Each outcome may result from performance of one or more functions.

For instance, reformation of the fundamental processes in educational and research organization and improvements in managerial decision making in the face of limited resources consolidate the university's position at the core of the ecosystem and promote its innovative leadership. When the nature of interactions within the ecosystem changes from unilateral influence to partnership and networking,

Figure 2. **Greenfield projects in higher education with a significant impact on universities**
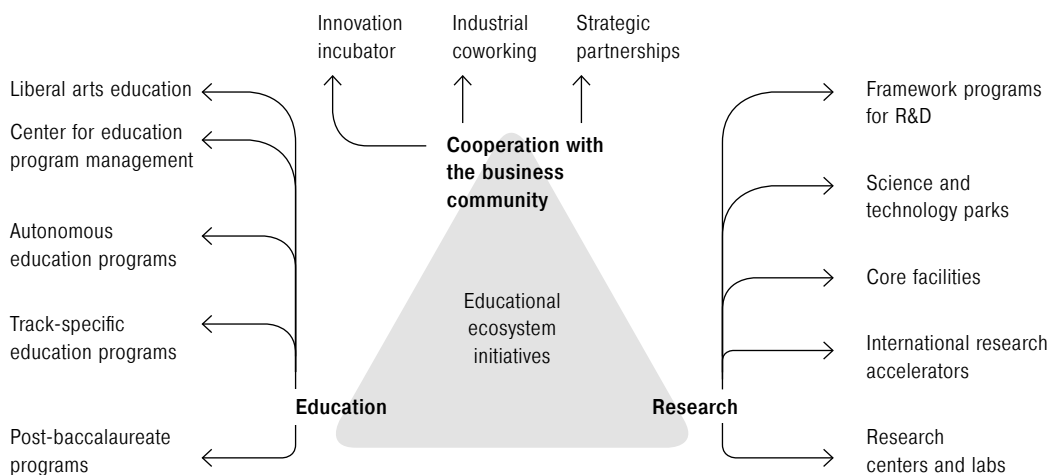
it stimulates the emergence of new educational and research collaborations, science parks and seed accelerators. Beside increasing the ecosystem's ability to respond promptly to changing conditions by introducing new practices and education programs, the new model of interaction also promotes an environment conducive to adaptation and upscaling of successful initiatives.

As greenfield projects advance and receive support alongside traditional practices, they become the points of growth amidst deeply rooted traditions and institutional inertia. Greenfield is sometimes regarded as a challenge to the education system, as universities are inert and used to changing vegetatively.[3] Various initiatives and practices that have proven their efficacy are borrowed by other elements of the educational ecosystem and thus come to prevail in it (Figure 2). Such new practices are adopted by representatives of different universities and university systems, enriching the educational ecosystem, which scales them up and thereby adapts to changing conditions.

The debate on greenfield in Russian education started with the publication *Greenfield Era in Education: SEDeC Research*. The authors define greenfield as "innovative educational projects, educational startups, as projects unconstrained by prior work." [Volkov, Konanchuk 2013:2]. Having analyzed the key trends in education, assessed

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[3] *"Good Greenfield" Criteria to Be Discussed at Tyumen State University.* 5–100, a project designed to maximize the competitive position of a group of leading Russian universities in the global research and education market. Available at: https://www.5top100.ru/news/108132/

the potential of the new technology platform and summarized the international experience of greenfield projects in education, they call for a change in the logic of approaching the future of education, suggesting that the learning process be treated as a "competence chain". Further discussion entailed the concentration of effort and cooperation among the leading universities, which resulted in the first greenfield projects in Russia's higher education: ITMO University, National Research University Higher School of Economics, Skolkovo Institute of Science and Technology (Skoltech), Tyumen State University, Tomsk State University, Peter the Great St. Petersburg Polytechnic University, Samara University, and Sevastopol State University.

However, greenfield projects in higher education are still very few[4], since new universities appear rarely, and integration of greenfield areas into the existing ones requires administrative willpower and a great deal of financial investment. Therefore, new education initiatives are developing alongside traditional practices, even in the most innovative universities. At ITMO University, for instance, 30% of the research and development infrastructure facilities integrated over the last six years were a product of reorganization, while 70% were fundamentally new structures [Vasilyev et al. 2014]. New institutions were set up at Tomsk State University (Higher IT School (HITs)), Tyumen State University (School of Advanced Studies (SAS), Institute of Environmental and Agricultural Biology (X-BIO)), Peter the Great St. Petersburg Polytechnic University (Institute of Advanced Manufacturing Technologies), Samara University (Artificial Intelligence Laboratory) and Sevastopol State University (Institute of City Development, Institute of National Technology Initiative, Institute of Social Sciences and International Relations, Development Research Innovation Master (DRIM)).

Although these institutions are not essentially exogenous to universities, a different format of operation and a new policy for managerial decision making allow these structures to be classified as greenfield projects—often local, but with prospects for development and upscaling.

Basically, greenfield projects in higher education share the following common characteristics:

1. Emerging as spaces for new education initiatives based on innovative technology, they are oriented towards the global market.
2. Representing a response of the educational ecosystem to the changing environment, they transform the ecosystem, enriching it with new elements and fostering its innovative growth.

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[4] Timirchinskaya O. (2019) *Zelenoe pole dlya obrazovaniya: chto takoe grinfildy* [Greenfield Projects for Education]. Available at: https://www.gazeta.ru/science/2019/08/26_a_12602119.shtml

3. Advancing and receiving support alongside traditional practices, they become growth points amidst deeply rooted traditions and institutional inertia.
4. Bringing together educational, research and business innovators and applying an interdisciplinary approach, they require project managers as a new class of workers.

New educational practices can also arise outside universities, as initiatives of private educational institutions or other communities. Nevertheless, universities as centers of established or emerging educational ecosystems are the first to adopt new practices in higher education. It is the leading universities—which bring together innovators and cooperate with agents of systemic change—that are able to elaborate innovative greenfield projects using the latest educational practices and initiatives and implement them to sustain and advance their own ecosystem.

A good greenfield project must have the following distinguishing characteristics:

1. Orientation towards the global market along with implementation at the local level.
2. Involvement in horizontal connections within the university.
3. Interdisciplinary research and educational products.
4. A fundamentally different organizational model of management and operations (a dedicated management system, specialized services, etc.)
5. Freedom from institutional pressure, development in a vacant niche.
6. Ability to generate a significant flow of income relatively quickly.
7. New expert groups involved in the development and implementation of initiatives.
8. Adaptability and scalability for use by other elements of the ecosystem in case of successful implementation.

An education initiative possessing these characteristics qualifies as a greenfield project.

Siberian Greenfield: BS BRICS

BS BRICS (BS BRICS) was founded in 2017 as part of Irkutsk National Research Technical University (INRTU). With fundamentally new structure and process organization, this educational center offering English-taught programs became a platform for international research collaborations. The launch of BS BRICS was one of the key initiatives aimed at developing the Baikal Innovation Hub on the basis of INRTU—an ecosystem that would serve as a platform for high-potential innovative projects, generate solutions for sustainable socioeconomic development of Lake Baikal region, and be open to anyone will-

Figure 3. **Specific features of BS BRICS as a greenfield project**

BAIKAL SCHOOL OF BRICS		
Organizational model of management and operations	Unique conditions for implementation of educational and research programs	Funding
↓	↓	↓
· Methodological and infrastructural support in English · International service center providing assistance to foreign students and faculty (including mentorship) · Extensive network of partner offices abroad	· Export orientation · Interdisciplinary approach · High degree of internationaliza-tion · Cultivation of sustainable development values and culture · New practices of academic cooperation · Outsourcing of individual educa-tional trajectories	· Regional budget (regional innovative development program) · INRTU funds · Revenue from export of education programs
↓	↓	↓
Elaboration and implementa-tion of a sustainable development strategy for the university	Improved academic reputation of the university	Increased productivity of the university's educatio-nal and research teams
↓	↓	↓
TRANSFORMATION OF INRTU INTO THE BAIKAL INNOVATION HUB		

ing to study the best practices. This hub is a product of joint efforts of the academic, business and government sectors, an example of how a particular greenfield project has transformed the ecosystem (Figure 3). It was with the Baikal Innovation Hub in Eastern Siberia project that INRTU became a first-prize winner at the university competition administered within the framework of the priority project Universities as Centers of Innovation.

The project was designed to create an institution that would increase the degree of university internationalization and provide not only favorable but unique conditions for developing new education programs, promoting applied and fundamental research with scalable findings, and improving the university's position in the international rankings and the market of higher education. BS BRICS is a platform for producing professionals possessing in-demand competencies in such areas as economics, management, engineering and sustainable development. Ability to create sustainable values for businesses and

society and to make responsible decisions with long-lasting effects on the global economy, including the BRICS countries, will turn them into "global innovators"—the most sought-after experts in the international labor market [Bedny, Gruzdinsky 2014].

At the stage of design, the developers defined the emerging project as greenfield for the university. Its orientation towards the global market was supposed to be reinforced and supplemented by relative freedom from institutional pressures, a fundamentally new system of structural and methodological support, interdisciplinarity, close horizontal relations and a focus on economic efficiency.

The basic processes (education and research) are export-oriented and carried out exclusively in an English-speaking environment. The developers set their sights on bringing educational products to global markets without prior domestic testing—an approach that is fundamentally different from the traditional one. Located in the Asian part of Russia, Irkutsk Oblast is closely connected with the economies of Northeast Asia, especially China and Mongolia, tourism dominating the structure of its regional service export and increasing the potential for positioning greenfield projects in the relevant markets. Not least for these reasons, Asia became the first destination for export of the school's educational products. The decision to make research export-oriented was dictated by the need to upgrade the scientific potential of INRTU and the regional research landscape using new ideas borrowed from the global research agenda in the areas identified as key for greenfield.

Orientation towards the global market is accentuated by using the unique brand of Lake Baikal. On the one hand, this indicates a socially responsible player in the educational ecosystem, and on the other hand, it adds a unique "face" to the Siberian greenfield project, associating the young brand with the global reputation of a world-famous cultural heritage site, stimulating potential importers' interest in its educational products, and attracting researchers of various fields to Irkutsk.

Interdisciplinarity of research and educational products manifests itself in the choice of field of study and areas of research interest. The modules of Ecology Engineering and Clean Energy, the flagship Bachelor's degree, are designed to train professionals who will take on the mission of tackling the planet's problems by means of renewable energy system development and implementation, waste management optimization, wastewater recycling and reusing, air purification and soil decontamination. These priorities earned a sustained interest from Asian and African students as well as professors from several countries who came to work at BS BRICS.

While elaborating this greenfield project, the developers also considered the current trends in the export of Russian education. The two most popular fields of study attracting foreign students to Russia are Clinical Medicine and Economics and Management [Center

for Sociological Research, Ministry of Science and Higher Education of the Russian Federation 2019]. Taking account of the economics and management field of study licensed at INRTU, the creators of BS BRICS launched two English-taught Bachelor's degree programs, concentrating the international business baccalaureate curricula on the experience and practices of Asian companies, artificial intelligence and business digitalization. For Russian students in the region willing to learn more about China as the world's fastest-growing economy, the project offers an English-taught double degree program jointly with a leading Chinese university. The program is dedicated to sustainable innovative development, and the curriculum features courses on green economy and projects aimed at exploring ways of increasing profitability through the integration of innovative solutions.

The project has evolved in the context of extremely limited resources, the local university environment being characterized by a very low degree of faculty, student and service internationalization. There was a pressing need to revise the models of management, especially with regard to financial flows. By 2017, INRTU no longer had special purpose funding as a national research university and was not covered by federal support initiatives, such as Project 5–100. Under the regional innovative development program, the regional budget allocated 2 million rubles for the development of BS BRICS in 2018 and 3 million rubles in 2019. These funds, plus a small investment from the university itself, sufficed for analyzing the foreign markets, designing competitive export-oriented educational products, inviting education program managers and financing a marketing and recruitment campaign in Asia. Subsequent development of the project, including the involvement of leading foreign and Russian professors and the purchase and equipment of a separate building, has been driven by revenue from education export. As nearly all education programs are tuition-based, BS BRICS is independent from the federal budget in establishing the salaries for its leading foreign professors.

An international service center was created as part of the rectorate to provide support and induction for the growing number of foreign professors and students, as well as to connect the school's environment with traditional university structures, such as human resources, accounting, research department, etc. In addition, an education export department was established as part of the Office for International Cooperation to ensure a stable flow of income from the greenfield project. Development of a dedicated system of management and operations and a relevant infrastructure for Baikal school of BRICS marked the beginning of transformation in managerial decision making.

When designing this greenfield project, the developers sought to create an environment conducive to exchange of competencies and adaptation and upscaling of successful education and research initiatives. Siberian greenfield launched renewal processes in the univer-

Table 1. **Education programs offered by BS BRICS**

Bachelor's degrees	Ecology Engineering and Pure Energy (field of study: Energy and Power Engineering)
	Sustainable Innovative Economics (field of study: Economics)
	International Business (field of study: Management)
	Journalism and Communications (field of study: Journalism)
	Artificial Intelligence and Computer Science (field of study: Information Systems and Technologies)
Master's degrees	Renewable Energy (field of study: Energy and Power Engineering)
	Digital Technologies, Networks and Big Data (field of study: Innovative Systems and Technologies)
	Business Administration (field of study: Management)

sity, and the first stories of the school's success made a number of university teams rethink their role in the modernization of INRTU and consider starting their own projects.

The school enrolled its first Bachelor's and Master's degree students in the 2018/19 academic year. New fields of study—Journalism and Communications, Artificial Intelligence and Computer Science (Bachelor's degrees), and Digital Technologies, Networks and Big Data (Master's degree)—have been added for the 2020/21 academic year. The array of degree programs offered by the school is constantly expanding (Table 1).

As of September 1, 2019, there were 200 students from Ghana, Egypt, Zimbabwe, China, Mongolia, Liberia, Nigeria and Russia enrolled in the English-taught programs of BS BRICS. The population of students pursuing Bachelor's degrees increased sixfold in two academic years (Figure 4). In addition, ten foreign professors and experts were invited from the United States, Iran, Australia, India, Vietnam and China to do research and teaching.

Private investments in INRTU increased by 3.15 times in two years (2017–2019), mainly as a result of launching BS BRICS and exporting its educational products. Greenfield became a growth point, attracting significant financial flows (Figure 5). Educational projects created from scratch, which not only gained popularity among students but also yielded a decent amount of profit, reached a critical mass. INRTU's revenues from export of the school's English-taught programs exceeded 65 million rubles, accounting for about 54% of total education export income of the university.

This model of a greenfield project in education, fundamentally export-oriented and initiated at a peripheral national research university, has its strengths and weaknesses. The latter include the following:

Figure 4. **The population of Bachelor's degree students in BS BRICS**, Number of students enrolled
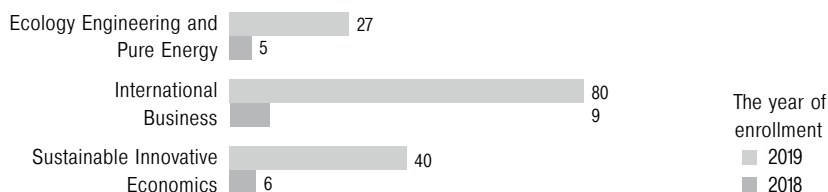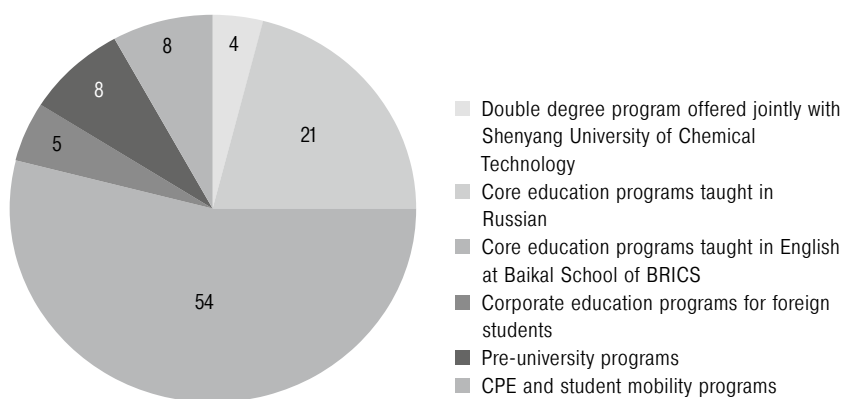

Figure 5. **The structure of INRTU' education export income in 2019,** %

Location in a peripheral region. At project launching, the population of Irkutsk Oblast was about 2.4 million, offering a relatively small number of potential applicants for BS BRICS. The demographic situation in the neighboring regions was not too favorable, either.

A high level of tuition costs in English-taught Bachelor's and Master's degree programs, as compared to the regional average, restricts the access to BS BRICS for talented applicants from low-income families.

The greenfield project is affected by the university's well-established reputation as a supplier of engineers, primarily for the region's mining, energy and aircraft industries. Many of Russian students do not regard INRTU as a place for learning anything beyond engineering or studying in English.

Nevertheless, BS BRICS has become a driver of positive transformation, increasing significantly the university's involvement in the processes of internationalization. INRTU was the only university in Eastern Siberia ranked in Times Higher Education (THE) University Impact Rankings in 2019, where it was included in the 310–400 band. In 2019,

INRTU was also ranked for the first time in the regional QS EECA University Rankings as a result of the university's improved reputation in the region. In 2020, INRTU was ranked 77th in Forbes University Ranking (Universities for the Future Elite: 100 Best Russian Universities According to Forbes—2020). The university's positions improved following an increase in the percentage of foreign professors and students as well as in the number of foreign internships organized.

An exponential growth in the number of foreign students and professors at the university is gradually reaching a critical mass for changing its orientation from traditional to international (the percentage of foreign students in the total population of full-time students was 8.75% in 2019, 2% higher than in 2017). The level of proficiency in English among Russian faculty is also growing: professors of BS BRICS have designed a professional development program called English in Professional Communication to expand the pool of candidates for delivering the English-taught programs.

The systemic effects of this greenfield project also manifest themselves in that, by implementing project-based learning in English, it significantly expands Russian students' opportunities to study the project objectives and practices of foreign companies and promotes extrapolation of unique practices in delivering English-taught programs to the entire university, strengthening horizontal ties, especially in the context of growing education program autonomy.

A significant increase in the university's income from education export stimulates research collaborations and innovation funding. Having accumulated the revenue from education export, BS BRICS moved to the second phase of its development—shifting the focus from education alone to education and research by serving a basis for creating a new intellectual center for the region's ecosystem. Development of new avenues for research will help connect foreign innovations with the region's needs as well as global trends with the existing interdisciplinary programs offered by INRTU.

In 2020, the following priority areas of research were defined: Ecology and Renewable Energy, Industrial Mathematics, Green Economy, and Global Governance. Social responsibility of the Siberian greenfield project is based on (i) research in the field of hydroelectricity and other types of renewable energy carried out jointly by Russian and foreign scientists, (ii) elaboration of ways to reduce the anthropogenic impact on the Baikal territory, and (iii) training of leaders with a sustainable mindset. Programs in Industrial Mathematics are designed to optimize the technology and processes of major Russian companies in accordance with the region's climate and other regional factors. The main goal of the international Industrial Mathematics Laboratory, created as part of BS BRICS in May 2020, is to design as well as import and adapt innovative technological solutions that meet the needs of such companies represented in the region as Gazprom, Rosneft, United Aircraft Corporation, TVEL, etc.

Performance of BS BRICS has shown that the new institution is successfully launching innovative transformations both in the university and in the ecosystem as a whole. Niche practices demonstrate applicability of its elements to a variety of university initiatives.

Conclusion The growing competition in the global market of education and research and the unconditional imperative of building an efficient innovative educational ecosystem in Russia dictated the need to transform the existing model of interactions among the state, business and academic community. The goals of sustainable development, the ideas of global education and changes in the educational paradigm as such have determined new paths for the evolution of higher education, which are based on extensive use of educational innovations. Greenfield projects emerge as spaces for new education initiatives supported by innovative technological solutions in response to changes in the institutional environment that conditions universities' performance and interactions with other elements of the educational ecosystem.

Greenfield projects foster the emergence and development of education initiatives designed to improve education quality and ensure transfer of knowledge and technology. Since greenfield project elaboration and implementation requires administrative willpower and a great deal of financial investment, successful and efficient initiatives are borrowed by other members of the academic community. This article demonstrates, using the example of Baikal School of BRICS, how university greenfield can generate positive transformations in the higher education ecosystem as well as the mechanisms of its impact and functionality.

The Siberian greenfield project has a multidimensional impact on the process of university adaptation to changing conditions as well as to the internationalization and competitiveness requirements. It can be considered not only as a purely educational product that affects the image and position of the university in the education market, but also as a new approach to managing institutional development. The project gave rise to new practices of academic cooperation, which can be extrapolated to non-greenfield communities.

Baikal School of BRICS was created to increase the innovative potential of INRTU (educational, research, technological and humanitarian initiatives) and to serve as the core of an educational ecosystem that would tackle the problems of socioeconomic development in the region. As a driver of transformation, the university does not passively integrate into the modern landscape of higher education, but shapes it using the new practices.

Having become the university's growth point in the face of limited funding, external environment pressures and a fierce competition for foreign students, the practice analyzed above raises new research questions and creates a space for discussion.

References   Akhopov V. (2012) Klyuchevye factory, vliyayushchie na otsenku grin-fild-proektov [Key Factors Influence on Valuation of Mining Greenfield]. *Nedropolzovanie XXI vek*, no 1, pp. 68–73.

Arzhanova I., Zhurakovskii V., Vorov A. (2014) Formirovanie seti natsionalnykh issledovatelskikh universitetov kak masshtabnaya institutsionalnaya innovatsiya v structure vysshey shkoly Rossii [Network of National Research Universities Formation as Large Institutional Innvation in the Structure of Higher Education in Russia]. *Perspectives of Science and Education*, no 5 (11), pp. 53–61.

Bedny A., Grudzinskiy A. (2014) Internatsionalizatsiya kak drajver innovatsionnogo razvitiya universiteta [Internationalization as a Driver for University Innovative Development]. *University Management: Practice and Analysis*, no 4–5, pp. 114–120.

Bertalanffy L. (1968) *General System Theory: Foundations, Development, Applications*. New York: George Braziller.

Bogdanov S., Timchenko V. (2019) Ekosistemnaya model razvitiya obrazovaniya v tsifrovoy ekonomike [Ecosystem Model of Education Development in Digital Economy]. *Menedzhment XXI veka: obrazovanie v epokhu tsifrovoy ekonomiki* [Management of the XXI Century: Education in the Digital Economy Era]. Saint-Petersburg: Publishing house of the Herzen State Pedagogical University of Russia, pp. 10–25.

Chesbrough H. W. (2003) *Open Innovation: The New Imperative for Creating and Profiting from Technology*. Boston: Harvard Business School.

Clark B. (1983) *The Higher Education System: Academic Organization in Cross-National Perspective*. Los Angeles: University of California.

Crow M. M., Dabars W. B. (2017) *Model novogo amerikanskogo universiteta* [Designing the New American University]. Moscow: HSE.

Davies R. B., Desbordes R., Ray A. (2018) Greenfield versus Merger and Acquisition FDI: Same Wine, Different Bottles? *Canadian Journal of Economics*, vol. 51, no 4, pp. 1151–1190.

De Corte E. (2014) Innovatsionnye perspektivy obucheniya i prepodavaniya v sfere vysshego obrazovaniya v XXI v. [An Innovative Perspective on Learning and Teaching in Higher Education in the 21st Century]. *Voprosy obrazovaniya / Educational Studies Moscow*, no 3, pp. 8–29. DOI: 10.17323/1814–9545–2014–3–8–29

Deem R. (2004) Novy menedzherializm i vysshee obrazovanie: upravlenie kachestvom i produktivnostyu raboty v universitetakh Velikobritanii [New Managerialism and Higher Education: Managing Quality and Productivity in UK Universities]. *Voprosy obrazovaniya / Educational Studies Moscow*, no 3, pp. 44–56.

Edquist C. (ed.) (1997) *Systems of Innovation: Technologies, Institutions and Organizations*. London: Pinter Publishers, Cassell Academic.

Efimov V., Lapteva A., Rumyantsev M. (2019) Nauka i obrazovanie regiona v ekosistemnoy perspective (na primere Krasnoyarskogo kraya) [Science and Education of the Region: The Ecosystem Perspective (The Case of the Krasnoyarsk Territory). *University Management: Practice and Analysis*, no 3, pp. 40–55.

Emelianov E., Aksenov P. (2011) Inostrannye investory i amerikanskoe gosudarstvo [Foreign Investors and US State]. *Issues of New Economy*, no 3, pp. 65–73.

Fedorov I. (2019) Perekhod ot obrazovatelnoy sredy k obrazovatelnoy ekosisteme [Transition from Educational Environment to the Educational Ecosystem]. *Molodoy uchyony*, no 28, pp. 246–250. Available at: https://moluch.ru/archive/266/61494/ (accessed 20 September 2020).

Flek M., Ugnich E. (2018) Profess,ualno-obrazovatelny klaster kak ekosistema:

razvitie v usloviyakh tsifrovoy transformatsii]. *Voprosy regulirovaniya ekonomiki / Journal of Economic Regulation*, vol. 9, no 4, pp. 146–159.

Foster J. (2005) From Simplistic to Complex Systems in Economics. *Cambridge Journal of Economics*, vol. 29, no 6, pp. 873–892.

Foster J., Wild P. (1996) Economic Evolution and the Science of Synergetics. *Journal of Evolutionary Economics*, no 6, pp. 239–260.

Froumin I., Dobryakova M. (2012) Chto zastavlyaet menyatsya rossiyskie vuzy: dogovor o nevovlechennosti [What Makes Russian Universities Change: Disengagement Compact]. *Voprosy obrazovaniya / Educational Studies Moscow*, no 2, pp. 159–191. DOI: 10.17323/1814–9545–2012–2–159–191

Fukuda K. (2020) Science, Technology and Innovation Ecosystem Transformation toward Society 5.0. *International Journal of Production Economics*, vol. 220(C). Available at: https://ideas.repec.org/a/eee/proeco/v220y-2020ics0925527319302701.html (accessed 20 September 2020).

Golubev O., Testov V. (2015) Network Information Technologies as a Basis of New Educational Paradigm. *Procedia—Social and Behavioral Sciences*, vol. 214, December, pp. 128–134.

Gornova G. V., Mityagin S. A. (2019) Tsveta urbanizma [Colours of Urbanism]. *Vestnik Omskogo gosudarstvennogo pedagogicheskogo universiteta. Gumanitarnye issledovaniya*, no 3, pp. 19–22.

Grant J. A. (1998) New Educational Paradigm for the New Millennium: Consciousness-Based Education. *Futures*, vol. 30, no 7, pp. 717–724.

Hanifin L., Eagle P., Ramirez R. (1994) Greenfield: A New Paradigm of Engineering Education, and Strategy for Its Rapid Development, Implementation and Dissemination. Proceedings of *1994 IEEE Frontiers in Education Conference (November 02–06, 1994, San Jose, California)*. Invited session 10, pp. 687–691.

Holland J. H. (1992) Complex Adaptive Systems. *Daedalus*, vol. 121, no 1, pp. 17–30.

Knyazev E., Drantusova N. (2012) Differentsiatsiya v vysshem obrazovanii: osnovnye kontseptsii i podkhody [Differentiation in Higher Education: The Main Concepts and Approaches to Study]. *University Management: Practice and Analysis*, no 5, pp. 43–52.

Kumar R., Neerja P. (2017) Technology-Mediated Learning Paradigm and the Blended Learning Ecosystem: What Works for Working Professionals? *Procedia—Computer Science*, vol. 122, January, pp. 1114–1123.

Lundvall B. A. (1992) *National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning.* London: Pinter Publishers.

Maksimova T., Nikolaev A., Byambatsogt D. (2018) Issledovatelskie universitety v structure natsionalnoy innovatsionnoy ekosistemu [Research Universities in the National Innovation Ecosystem]. *Theory and Practice of Social Development*, no 8, pp. 81–87.

Marginson S. (2014) Rossiyskie nauka i vysshee obrazovanie v usloviyakh globalizatsii [Russian Science and Higher Education in a More Global Era]. *Voprosy obrazovaniya / Educational Studies Moscow*, no 4, pp. 8–35. DOI: 10.17323/1814–9545–2014–4–8–35

Ministry of Higher Education and Science of the Russian Federation, Centre for Social Research (2019) *Obuchenie inostrannykh grazhdan v obrazovatelnykh organizatsiyakh vysshego obrazovaniya Rossijskoy Federatsii: statisticheskiy sbornik* [Training of Foreign Citizens in Higher Education Institutions of the Russian Federation: Statistical Collection]. Iss. 16. Available at: https://5top100.ru/documents/library/113495 (accessed 20 September 2020).

Moore J. F. (2006) Business Ecosystems and the View from the Firm. *The Antitrust Bulletin*, vol. 51, no 1, pp. 31–75.

Moore J. F. (1996) *The Death of Competition: Leadership and Strategy in the Age of Business Ecosystems.* New York: Wiley Harper Business.

Moore J. F. (1993) Predators and Prey: A New Ecology of Competition. *Harvard Business Review*, no 3, pp. 75–86.

Sanchez R., Heene A. (2004) *The New Strategic Management: Organization, Competition and Competence.* New York: Wiley.

Seroshtan M., Ketova N. (2020) Sovremennye rossijskie universitety: pozitsionirovanie, trendy razvitiya, vozmozhnosti narashchivaniya konkurentnykh preimushchestv [Modern Russian Universities: Positioning, Development Trends, Potential to Enhance Competitive Advantages]. *Vysshee Obrazovanie v Rossii / Higher Education in Russia*, vol. 29, no 2, pp. 27–40.

Shrivastava P. (1998) Implementing Socrates Knowledge Management System for Education and Training. Proceedings of *WebNet 98—World Conference on the WWW and Internet and Intranet (November 07–12, 1998, Orlando)*, pp. 7–12.

Sigova S., Serebryakov A., Luksha P. (2013) Formirovanie perechnya vostrebovannykh kompetentsiy: pervy opyt Rossii [Creating the List of Competences in Demand: First Russian Experience]. *Lifelong Education: The XXI Century*, no 1, pp. 61–71.

Simon H. (1972) The Architecture of Complexity. *Proceedings of the American Philosophical Society*, vol. 106, pp. 467–482.

Tomina E. (2011) Pedagogicheskie idei Dzhona Dyui: istoriya i sovremennost [Pedagogical Ideas of John Dewey: History and Contemporaneity]. *Vestnik of the Orenburg State University*, no 2, pp. 360–366.

Tomozii S. E., Topala I. (2014) Why Do We Need to Change the Educational Paradigms? *Procedia—Social and Behavioral Sciences*, vol. 142, August, pp. 586–591.

Townsend A. (2019) *Umnye goroda: bolshie dannye, grazhdanskie khakery i poiski novoy utopii* [Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia]. Moscow: Publishing House of the Gaidar Institute.

Trapitsin S., Timchenko V., Krokinskaya O. (2015) Quality Assessment in Higher Education: Are Russian Universities Focused on The Educational Needs of Students? *International Journal for Quality Research*, vol. 9, no 2, pp. 339–354.

Vasilyev V., Toivonen N., Kazin Ph., Yanykiva N. (2014) Innovatsionnaya ekosistema Universiteta ITMO. Itogi i perspektivy program razvitiya [Innovation Ecosystem of the ITMO University. Results and Perspectives of the Development Programs]. *Innovations*, no 8, pp. 27–33.

Volkov A., Konanchuk D. (2013) *Epokha "grinfilda" v obrazovanii: issledovanie SEDeC* [The Greenfield Era in Education: SEDeC Research]. Available at: https://skolkovo.ru/public/media documents/research/education_10_10_13.pdf (accessed 20 September 2020).

Vozmilova S., Volgina N. (2016) Avtomobilestroenie v strankakh Tsentralnoy Vostochnoy Evropy: sovremennye tendentsii razvitiya [Automotive Industry in Central and East European Countries: Modern Development Trends]. *RUDN Journal of Economics*, no 1, pp. 7–21.

Yin R. K. (2014) *Case Study Research Design and Methods.* Thousand Oaks, CA: Sage.

Zhuk M. (2014) Vyzovy professionalnomu obrazovaniyu XXI veka: prognozy i resheniya [The Challenges of Professional Education in the XXIst Century: Prognosis and Solutions]. *Professional Education in the Modern World*, no 1, pp. 65–74.

Zhurakovsky V., Vorov A. (2015) Integratsiya obrazovaniya i nauki v natsionalnykh issledovatelskikh universitetakh: sistemny effect dlya rossijskoy vysshey shkoly [The Integration of Education and Research in National Research Universities: Systemic Effect for the Russian Higher Education]. *Professional Education in Russia and Abroad*, no 4 (20), pp. 18–27.

Zmiyak S., Ugnich E., Taranov P., Yarovaya N. (2019) Rol opornogo universiteta v razvitii regionalnoy innovatsionnoy ekosistemy [The Role of Pillar University in the Regional Innovation Ecosystem Development]. *Scientific Bulletin: Finance, Banking, Investment*, no 1, pp. 163–171.

Teacher Professional Development in Russia and Kazakhstan
Evidence from TALIS-2018

Authors

Elena Chernobay
Doctor of Sciences in Pedagogy, Professor, Department of Educational Programs, Institute of Education, National Research University Higher School of Economics. Address: Bld. 10, 16 Potapovsky Lane, 101000 Moscow, Russian Federation. E-mail: echernobaj@hse.ru

Dilyara Tashibaeva
Master of Sciences in Leadership and Education, Senior Manager, Research Department, Nazarbayev Intellectual Schools AEO. Address: 21/1 Hussein bin Talal Str., 010000 Nur-Sultan, Republic of Kazakhstan. E-mail: tashibayeva_d@nis.edu.kz

Abstract

The results of the Teaching and Learning International Survey (TALIS-2018) of teachers and school leaders are used to compare the teacher professional development systems in Russia and Kazakhstan. In particular, comparative analysis concerns the induction and mentoring programs for beginning teachers, the mechanisms of teacher professional learning, teachers' needs for professional development, and barriers to the latter. TALIS-2018 involved over 4,000 teachers from 230 schools in Russia and over 6,000 teachers from 331 schools in Kazakhstan. Two-stage probability (random) sampling allows extrapolating the survey results to the whole population of schools and school teachers in every TALIS participating country. It was established that neither Russia nor Kazakhstan engaged in monitoring or assessing the mechanisms of support for young and beginning teachers, and teacher evaluation did not require completing an induction or mentoring program. Development of mechanisms to ensure that professional learning programs satisfy teachers' needs is a promising avenue for improving the system of teacher professional development. For this purpose, teachers in both countries are offered vouchers allowing them to choose professional development programs at their discretion. Overall, teachers' needs for professional development are similar in Russia and Kazakhstan, as are barriers to their satisfaction. Those needs should always be considered when updating the learning standards and curricula, especially with regard to such increasingly important aspects of teaching as critical thinking and the use of digital technology. Particular attention should be paid to the development of special education teacher skills.

References

Adamson B. (2012) International Comparative Studies in Teaching and Teacher Education. *Teaching and Teacher Education*, vol. 28, no 5, pp. 641–648.

Allen J., Rowan L., Singh P. (2019) Status of the Teaching Profession—Attracting and Retaining Teachers. *Asia-Pacific Journal of Teacher Education*, vol. 47, no 2, pp. 99–102. DOI:10.1080/1359866X.2019.1581422.

Boslaugh S. (2007) Secondary Data Sources for Public Health: A Practical Guide. New York: Cambridge University.

Bridges D. (ed.) (2014) *Education Reform and Internationalisation: The Case of School Reform in Kazakhstan*. New York: Cambridge University.

Chapman D. W., Weidman J., Cohen M., Mercer M. (2005) The Search for Quality: A Five Country Study of National Strategies to Improve Educational

Quality in Central Asia. *International Journal of Educational Development*, vol. 25, no 5, pp. 514–530.

Clark N. (2005) Education Reform in the Former Soviet Union. *World Education News and Reviews*. Available at: http://www.wes.org/eWENR/PF/05dec/pf-feature.html (accessed 20 September 2020).

Cohen B., Fuller E. (2006) *Effects of Mentoring and Induction on Beginning Teacher Retention*. Paper Presented at the Annual Meeting of the American Educational Research Association (2006, San Francisco, CA).

Darling-Hammond L. (2017) Teacher Education around the World: What Can We Learn from International Practice? *European Journal of Teacher Education*, vol. 40, no 3, pp. 291–309.

Darling-Hammond L. (2015) *The Flat World and Education: How America's Commitment to Equity Will Determine our Future.* New York: Teachers College.

Darling-Hammond L., Hyler M. E., Gardner M. (2017) *Effective Teacher Professional Development*. Palo Alto, CA: Learning Policy Institute.

Darling-Hammond L., Wei R. C., Andree A. (2010) *How High-Achieving Countries Develop Great Teachers.* Stanford, CA: Stanford Center for Opportunity Policy in Education.

Efimova G., Semyonov M. (2015) Klyuchevye baryery, prepyatstvuyushchie effektivnoy rabote uchitelya: po materialam sotsiologicheskogo issledovaniya [The Key Barriers to Effective Work of Teachers: Based on Sociological Research Data]. *Theory and Practice of Social Development*, no 20, pp. 38–43.

Evers A., van der Heijden B., Kreijns K. (2016) Organizational and Task Factors Influencing Teachers' Professional Development at Work. *European Journal of Training and Development*, vol. 40, no 1, pp. 36–55.

Federal Institute for Education Quality Assessment (2019) *Otchyot po rezultatam mezhdunarodnogo issledovaniya uchitelskogo korpusa po voprosam prepodavaniya i obucheniya TALIS-2018* [Report on the Results of the International Study of Teachers ' Corps on Teaching and Learning TALIS-2018]. Available at: https://fioco.ru/talis (accessed 20 September 2020).

Fitzpatrick M., Figueroa D. T., Golden G., Crosby S. (2018) *Education Policy Outlook: Kazakhstan*. Paris: OECD.

Fletcher S. H., Strong M., Villar A. (2008) An Investigation of the Effects of Variations in Mentor-Based Induction on the Performance of Students in California. *Teachers College Record*, vol. 110, no 10, pp. 2271–2289.

Glazerman S., Isenberg E., Dolfin S., Bleeker M., Johnson A., Grider M., Jacobus M. (2010) *Impacts of Comprehensive Teacher Induction: Final Results from a Randomized Controlled Study. NCEE 2010–4027*. Washington, DC: National Center for Education Evaluation and Regional Assistance.

Greenhoot A. F., Dowsett C. J. (2012). Secondary Data Analysis: An Important Tool for Addressing Developmental Questions. *Journal of Cognition and Development*, vol. 13, no 1, pp. 2–18.

Gustafsson J. E. (2008) Effects of International Comparative Studies on Educational Quality on the Quality of Educational Research. *European Educational Research Journal*, vol. 7, no 1, pp. 1–17.

HSE (2019) *Obrazovanie v tsifrakh. Kratkiy statisticheskiy sbornik* [Education in Numbers. Summary of Statistics]. Moscow: HSE.

Huisman J., Smolentseva A., Froumin I. (eds) (2018) *25 years of Transformations of Higher Education Systems in Post-Soviet Countries: Reform and Continuity.* Cham: Palgrave Macmillan.

Ingersoll R. M., Smith T. M. (2004) Do Teacher Induction and Mentoring Matter? *NASSP Bulletin*, vol. 88, no 638, pp. 28–40.

Ingersoll R. M., Strong M. (2011) The Impact of Induction and Mentoring Programs for Beginning Teachers: A Critical Review of the Research. Review of Educational Research, vol. 81, no 2, pp. 201–233.

Irsaliev S., Kamzoldaev M., Tashibaeva D., Kopeeva A. (2019) *Uchitelya Kazakhstana: pochemu molodye lyudi vybirayut etu professiyu i chto motiviruet ostavatsya v ney? Analiticheskiy otchyot* [Teachers of Kazakhstan: Why Do Young People Choose this Profession and What Motivates Them to Stay in It? Analytical Report]. Astana: Public Association "Center for analysis and strategy «Beles»". Available at: https://www.soros.kz/wp-content/uploads/2019/02/Учителя-Казахстана.pdf (accessed 20 September 2020).

Jovanova-Mitkovska S. (2010) The Need of Continuous Professional Teacher Development. *Procedia—Social and Behavioral Sciences*, vol. 2, no 2, pp. 2921–2926.

JSC "Information and Analytical Center" (2019) *Statistika sistemy obrazovaniya Respubliki Kazakhstan. Natsionalny sbornik* [Statistics of the Education System of the Republic of Kazakhstan. National Collection]. Available at: http://iac.kz/sites/default/files/nacionalnyy_sbornik_2019–2020.pdf (accessed 20 September 2020).

Meissel K., Parr J., Timperley H. (2016) Can Professional Development of Teachers Reduce Disparity in Student Achievement? *Teaching and Teacher Education*, vol. 58, no 1, pp. 163–173.

Ministry of Education and Science of the Republic of Kazakhstan, JSC "Information and Analytical Center" (2019) *Natsionalny doklad o sostoyanii i razvitii sistemy obrazovaniya Respubliki Kazakhstan (po itogam 2018 g.)* [National Report on the State and Development of the Education System of the Republic of Kazakhstan (Based on the Results of 2018). Available at: http://iac.kz/sites/default/files/0_nacionalnyy_doklad_za_2018_god_final_s_oblozhkami_na_sayt_compressed_0.pdf (accessed 20 September 2020).

Mizell H. (2010) *Why Professional Development Matters*. Oxford, OH: Learning Forward.

OECD (2020) *TALIS2018 Results. Vol. II: Teachers and School Leaders as Valued Professionals.* Paris: OECD. Available at: https://doi.org/10.1787/19cf08df-en (accessed 20 September 2020).

OECD (2019a) *TALIS2018 Results. Vol. I: Teachers and School Leaders as Lifelong Learners*. Paris: OECD. Available at: https://doi.org/10.1787/1d0bc92a-en (accessed 20 September 2020).

OECD (2019b) *TALIS2018 Technical Report*. Paris: OECD. Available at: https://www.oecd.org/education/talis/TALIS_2018_Technical_Report.pdf (accessed 20 September 2020).

OECD (2014a) *Reviews of National Policies for Education: Secondary Education in Kazakhstan.* Paris: OECD. Available at: https://doi.org/10.1787/9789264205208-en (accessed 20 September 2020).

OECD (2014b) *TALIS2013 Results: An International Perspective on Teaching and Learning*. Paris: OECD. Available at: http://dx.doi.org/10.1787/9789264196261-en (accessed 20 September 2020).

OECD (2009) *Creating Effective Teaching and Learning Environments: First Results from TALIS.* Paris: OECD. Available at: https://www.oecd.org/education/school/creatingeffectiveteachingandlearningenvironmentsfirstresultsfromtalis.htm (accessed 20 September 2020).

OECD (2005) *Teachers Matter: Attracting, Developing and Retaining Effective Teachers. Final Report: Teachers Matter*. Paris: OECD. Available at: https://www.oecd.org/education/school/attractingdevelopingandretainingeffectiveteachers-finalreportteachersmatter.htm (accessed 20 September 2020).

OECD, The World Bank (2015) *OECD Reviews of School Resources: Kazakhstan 2015.* Paris: OECD. Available at: http://dx.doi.org/10.1787/9789264245891-en (accessed 20 September 2020).

Opfer V. D., Pedder D. (2011) Conceptualizing Teacher Professional Learning. *Review of Educational Research*, vol. 81, no 3, pp. 376–407.

Schleicher A. (2018) *World Class: How to Build a 21st-Century School System, Strong Performers and Successful Reformers in Education*. Paris: OECD. Available at: http://dx.doi.org/10.1787/4789264300002-en (accessed 20 September 2020).

Silova I., Niyozov S. (eds) (2020) *Globalization on the Margins: Education and Post-Socialist Transformations in Central Asia*. Charlotte, NC: Information Age.

Steiner-Khamsi G. (2016) Uchit, chtoby vyzhit: oplata truda po stavke i ee vozdeystvie na kachestvo prepodavaniya [Teach or Perish: The Stavka System and its Impact on the Quality of Instruction References]. *Voprosy obrazovaniya/Educational Studies Moscow*, no 2, pp. 14–39. DOI:10.17323/1814-9545-2016-2-14-39.

Villegas-Reimers E. (2003) *Teacher Professional Development: An International Review of the Literature*. Paris: International Institute for Educational Planning.

Strategies and Tactics of Academics in the Context of Transition toward the Entrepreneurial University

Author   **Lidia Yatluk**
Oxford Russia Fellow, Head of Instructional Design and Development Department, Modum Lab.
Address: 35A Lermontovsky Ave, 190068 St. Petersburg, Russian Federation.
E-mail: lidiaoutlook@gmail.com

Abstract   A new form of the university has been emerging since the 1980s. Open, closely connected to the state and businesses, and internalizing the market logic of decision making, the university is becoming entrepreneurial. In Russia, changes occur with a certain lag, but present-day Russian universities already feature the new forms of activities characteristic of the global trend, such as patents, academic incubators, science parks, and startups. Formally, Russian universities have already become entrepreneurial, but they still remain traditionally overregulated institutions. In addition to collisions between the traditional logic of academia and the new one of the market that are typical of Western universities, Russia also features conflicts with the logic of bureaucracy.

A study based on 30 in-depth interviews with university researchers of virtual and augmented reality and five expert interviews with representatives of other market actors was conducted with a view to find out how everyday practices and strategies of academics change in the context of transition toward the entrepreneurial university. Referring to James C. Scott's concept of "mētis", we describe the most widespread situations of conflict between different logics: procuring and allocating lab funding, choosing problems for research and development, launching new education programs, and assigning statuses to institutional departments. Completing our theoretical framework with Robert K. Merton's anomie theory, we demonstrate possible versions of strategy design and possible reasons for choosing a specific course of action. The strategies of innovation and rebellion manifest themselves most saliently in the laboratories analyzed, while conformity, retreatism and ritualism are expressed mildly and blend into one another. However, regardless of the choices they make, academics still have enough freedom and creativity to avoid being determined completely of partially by any undesired logic.

References   Accounts Chamber of the Russian Federation (2020) *Otchyot o rezultatakh analiticheskogo meropriyatiya "Opredelenie osnovnykh prichin, sderzhivayushchikh nauchnoe razvitie v Rossijskoy Federatsii: otsenka nauchnoy infrastruktury, dostatochnost motivatsionnykh mer, obespechenie privlekatelnosti raboty vedushchikh uchyonykh"* [Report on the Results of the Analytical Event "Identification of the Main Reasons Hindering Scientific Development in the Russian Federation: Assessment of Scientific Infrastructure, Sufficiency of Motivational Measures, Ensuring the Attractiveness of the Work of Leading Scientists". Available at: http://audit.gov.ru/ (accessed 24 September 2020).

Alvesson M., Spicer A. (2016) (Un)Conditional Surrender? Why Do Professionals Willingly Comply with Managerialism. *Journal of Organizational Change Management*, vol. 29, no 1, pp. 29–45.

Anderson G. (2008) Mapping Academic Resistance in the Managerial University. *Organization*, vol. 15, no 2, pp. 251–270.

Ben-Yehuda N. (1990) Positive and Negative Deviance: More Fuel for a Controversy. *Deviant Behavior*, vol. 11, no 3, pp. 221–243.

Berman E. P. (2012) Explaining the Move toward the Market in US Academic Science: How Institutional Logics Can Change without Institutional Entrepreneurs'. *Theory and Society*, vol. 41, no 3, pp. 261–99.

Budyldina N. (2018) Entrepreneurial Universities and Regional Contribution. *International Entrepreneurship and Management Journal*, vol. 14, no 2, pp. 265–277.

Cardoso S., Carvalho T., Videira P. (2018) Is It Still Worth Working in Academia? The Views from Portuguese Academics. *Higher Education Policy*, vol. 32, no 4, pp. 663–679.

Carrier M. (2013) Values and Objectivity in Science: Value-Ladenness, Pluralism and the Epistemic Attitude. *Science and Education*, vol. 22, no 10, pp. 2547–2568.

Certeau M. de (2013) *Izobretenie povsednevnosti. Iskusstvo delat* [The Invention of Everyday Life. The Art of Making]. Saint-Petersburg: Publishing House of the European University in Saint Petersburg.

Clark B. R. (2019) *Sozdanie predprinimatelskikh universitetov. Organizatsionnye napravleniya transformatsii* [Creating Entrepreneurial Universities: Organizational Pathways of Transformation]. Moscow: HSE.

Cooper M. H. (2009) Commercialization of the University and Problem Choice by Academic Biological Scientists. *Science, Technology, & Human Values*, vol. 34, no 5, pp. 629–653.

Czarnitzki D., Doherr T., Hussinger K., Schliessler P., Toole A. (2015) *Individual versus University Ownership of University-Discovered Inventions. Center for European Economic Research Discussion Paper No 15–007*. Mannheim: Center for European Economic Research.

Demin P. (2017) Korporativnaya kultura predprinimatelskogo universiteta: potentsial izmereniya [Corporate Culture of the Entrepreneurial University: Measurement Potential]. *University Management: Practice and Analysis*, vol. 21, no 2, pp. 65–75.

Dzisah J. (2010) Capitalizing Knowledge: The Mind-Set of Academic Scientists. *Critical Sociology*, vol. 36, no 4, pp. 555–573.

Geiger R. L. (2018) *Znaniya i dengi. Issledovatelskie universitety i paradox rynka* [Knowledge and Money. Research Universities and the Paradox of the Marketplace]. Moscow: HSE.

Heckert A., Heckert D. M. (2004) Using an Integrated Typology of Deviance to Expand Merton's Anomie Theory. *Criminal Justice Studies*, vol. 17, no 1, pp. 75–90.

Hoffman S. G. (2011) The New Tools of the Science Trade: Contested Knowledge Production and the Conceptual Vocabularies of Academic Capitalism. *Social Anthropology*, vol. 19, no 4, pp. 439–462.

Institute for Statistical Studies and Economics of Knowledge of the HSE (2019) Otkrytost rossijskikh innovatsiy. Rezultaty proekta "Issledovanie aktivnosti subjektov innovatsionnogo protsessa: vozmozhnosti primeneniya novykh metodologicheskikh podkhodov" [Openness of Russian Innovations. Results of the Project "Research on the Activity of Subjects of the Innovation Process: Opportunities for Applying New Methodological Approaches]. Available at: https://issek.hse.ru/news/313995806.html (accessed 24 September 2020).

Knorr-Cetina K. (1981) *The Manufacture of Knowledge: An Essay on the Constructivist and Contextual Nature of Science*. Oxford: Pergamon.

Konstantinov G., Filonovich S. (2007) Chto takoe predprinimatelskiy universitet [What is a Business-Oriented University?]. *Voprosy obrazovaniya/Educational Studies Moscow*, no 1, pp. 49–62.

Krasnyak O. (2017) Gendernaya predstavlennost v rossijskikf akademicheskikh zhurnalakh [Gender Representation in Russian Academic Journals]. *Zhurnal Issledovaniy sotsialnoy politiki/Journal of Social Policy Studies*, vol. 15, no 4, pp. 617–628.

Leydesdorff L., Meyer M. (2010) The Decline of University Patenting and the End of the Bayh—Dole Effect. *Scientometrics*, vol. 83, no 2, pp. 355–362.

Lisyutkin M., Froumin I. (2014) Kak degradiruyut universitety? K postanovke problemy [How Universities Degrade? Towards the Problem Statement]. *University Management: Practice and Analysis*, no 4–5 (92–93), pp. 12–20.

Mendoza P. (2012) The Role of Context in Academic Capitalism: The Industry-Friendly Department Case. *Journal of Higher Education*, vol. 83, no 1, pp. 26–48.

Merton R. K. (2006) *Sotsialnaya teoriya i sotsialnaya struktura* [Social Theory and Social Structure]. Moscow: Khranitel.

Oliver A. L. (2009) *Networks for Learning and Knowledge Creation in Biotechnology.* Cambridge: Cambridge University.

Oliver A. L., Sapir A. (2017) Shifts in the Organization and Profession of Academic Science: The Impact of IPR and Technology Transfer. *Journal of Professions and Organization*, vol. 4, no 1, pp. 36–54.

Paul-Hus A., Bouvier R. L., Ni C., Sugimoto C. R., Pislyakov V., Larivière V. (2015) Forty Years of Gender Disparities in Russian Science: A Historical Bibliometric Analysis. *Scientometrics,* vol. 102, no 2, pp. 1541–1553.

Pushnyh V. (2010) Sravnitelnyy analiz organizatsionnykh kultur rossiyskogo i amerikanskogo universitetov [Comparative Analysis of Organizational Culture of Russian and American Universities]. *Voprosy obrazovaniya/Educational Studies Moscow*, no 4, pp. 291–306. DOI:10.17323/1814-9545-2010-4-291-306.

Radder H. (2010) *The Commodification of Academic Science*. Pittsburgh, PA: Pittsburgh University.

Rothaermel F., Agung S. D., Jiang L. (2007) University Entrepreneurship: A Taxonomy of the Literature. *Industrial and Corporate Change*, vol. 16, no 4, pp. 691–791.

Sá M. J., Ferreira C. M., Serpa S. (2019) (Un)Professionalisation or (Re)Professionalisation of the Academic in the Brave New World? *Postmodern Openings,* vol. 10, no 2, pp. 84–113.

Scott J. (2005) *Blagimi namereniyami gosudarstva. Pochemu i kak provalilis proekty uluchsheniya usloviy chelovecheskoy zhizni* [Seeing Like a State. How Certain Schemes to Improve the Human Condition Have Failed]. Moscow: Universitetskaya kniga.

Siegel D. S., Wright M. (2015) Academic Entrepreneurship: Time for a Rethink? *British Journal of Management*, vol. 26, iss. 4, pp. 582–595.

Slaughter S., Leslie L. (1997) *Academic Capitalism: Politics, Policies and the Entrepreneurial University*. Baltimore: Johns Hopkins University.

Volchik V., Filonenko YU., Averkieva E., Shiriaev I. (2016) Byurokratizatsiya i adaptivnoe povedenie v sfere vysshego obrazovaniya [Bureaucratization and Adaptive Behaviop in the Higher Education]. *Journal of Economic Regulation*, vol. 6, no 4, pp. 57–71.

Assessing Personality-Related Learning Outcomes in Master Programs

M. Ermolaeva, Ye. Isaev, D. Lubovsky

Marina Ermolaeva
Doctor of Sciences in Psychology, Professor, Professor Guruzhapov Department of Educational Psychology, Faculty of Educational Psychology, Moscow State University of Psychology and Education. Email: mar-erm@mail.ru
Yevgeny Isaev
Doctor of Sciences in Psychology, Professor, Professor Guruzhapov Department of Educational Psychology, Faculty of Educational Psychology, Moscow State University of Psychology and Education. Email: eiisaev@yandex.ru
Dmitry Lubovsky
Candidate of Sciences in Psychology, Professor, Professor Guruzhapov Department of Educational Psychology, Faculty of Educational Psychology, Moscow State University of Psychology and Education. Email: lubovsky@yandex.ru

Address: 20 Sretenka St, 127051 Moscow, Russian Federation.

Abstract. In this article, personality-related learning outcomes in educational psychology Master's programs are analyzed as professionally relevant personality traits, of which personal and professional identity are the core. An empirical study involved students enrolled in educational psychology Master's programs (60 in the first round and 35 in the second one). The study used Lydia Schneider's personal and professional identity diagnostic methods, L. Michelson's communicative competence test adapted by Yuri Gilbukh, and Mehrabian and Epstein's empathy scale. The results showed that Master's degree students experienced significant changes to their professional identity in the course of studies, making considerable progress in the development of communicative competence and empathy. Professionally relevant personality traits were found to show irregular dynamics during the first and second years of Master's studies. The article outlines avenues of further research on educational and psychological assessment of personality-related learning outcomes in Master's programs.
Keywords: assessment of personality-related learning outcomes, Master's degree students, professionally relevant personality traits, professional identity, communicative competence, empathy.

System-level assessments have become an important area of research in educational sciences. Present-day models for the evaluation of university effectiveness are based on combinations of input and output criteria, such as graduation rate [Abankina et al. 2013]. Much value is attached to longitudinal studies as a tool for increasing effec-

tiveness of educational institutions and of the national education system as a whole [Navodnov, Motova, Ryzhakova 2019]. Transition of university education to a competency-based framework, which implies projection of learning outcomes, adds a particular relevance to research aimed at designing programs for monitoring performance of all kinds, including personality-related learning outcomes. University education cannot be effective without monitoring the formation of students' personality-related learning outcomes, first of all because it won't be able to deal with the present-day anthropological challenge. The snowballing flows of information, the never-ending upgrades of information technology in all spheres of life, the dynamism of social life, and the high level of psycho-emotional strain at work require improving and maximizing the human potential of every human being.

University education cannot be restricted to transfer of knowledge to rising generations and to teaching them modern competencies and cognitive skills. Its purpose is bigger and consists in creating a human being in all the integrity of human manifestations: as a subject of one's professional activity, as a socially active and responsible person, and as a creative personality [Isaev 2017]. Holistic evaluation of university effectiveness is impossible without assessing the level of graduates' professionalism, of which professional identity is the core.

Educational researchers are actively searching for effectiveness criteria. A lot of studies have used end-of-program evaluations to assess educational effectiveness [Curby et al. 2020]. Today, however, more and more attention is paid to the process of achieving personality-related learning outcomes, which is reflected in new mid-program evaluation projects [Murat Sozer, Zeybekoglu, Kaya 2019]. Other indicators of educational effectiveness include students' expectations of university education [Ivanyushina, Alexandrov, Musabirov 2016], their evaluations of its usefulness for career success [Tuononen, Parpala, Lindblom 2019], and their satisfaction with the learning process [Borch, Sandvoll, Risør 2020].

International researchers explore the criteria for assessing professionalism as the main learning outcome in university education [Hamilton 2017], regarding professional identity as the foundation of professionalism, especially in human interaction professions. A considerable amount of research has been focused on professional identity formation in medical students [Houseknecht et al. 2019]. Furthermore, there are findings on the professional identity of teachers [Fadie et al. 2020] and novice counselors [Katalinic 2018]. Remarkably, studies on professional identity formation in medical workers still rely on the theoretical model proposed by George E. Miller [Miller 1990], although a number of modifications have been suggested by present-day scholars [Cruess et al. 2015]. This model is built around the idea that professional identity is formed by "merging" with the profession and following all the way from knowledge to action. This approach is in line with the concept of professional identity proposed by Lydia Schneider,

who defined professional identity as "objective and subjective one-ness with the profession and professional community, which provides for continuity of an individual's professional characteristics (norms, roles, and statuses)" [Schneider 2007:64].

Therefore, the recent years have witnessed a growing interest in using personality-related learning outcomes to assess the quality of university education. It would be appropriate to say that significance of such studies is not restricted to the design of tools for monitoring students' personality-related learning outcomes. Development of agency as a prerequisite and outcome of professional education [Isaev 2017] requires in-depth analysis.

Cultivation of professionally relevant personality traits should be the focus when preparing human interaction professionals in Master's degree programs. High requirements to the level of professionally relevant personality traits among teaching staff (teachers and educational psychologists) stem from the obvious expectation that soon-to-be experts should possess the qualities that they will cultivate in their students.

A large-scale experiment on the modernization of teacher education carried out in 2014–2017 by a research team from Moscow State University of Psychology and Education allowed substantiating a model of continuing teacher education and a generalized competency-based model of an educational psychology graduate as well as developing guidelines for the main teacher education programs in accordance with the professional standards and the Federal State Education Standards of Higher Education (FSES HE) 3++ [Rubtsov, Guruzhapov, Makarovskaya, Maximov 2014; Margolis, Safronova 2018]. Many of the strategies proposed for modernization of teacher education later became part of various projects and plans. At the same time, directions for improving the quality of education programs have become obvious over the past years. A top priority in the modernization of Master's degree programs is to consider the context in which personality-related learning outcomes of educational psychology Master's students are formed. Significant frame-of-mind differences between students obtaining their first vs. second academic degree have been reported [Ermolaeva, Lubovsky 2015]. However, there has been little research on the formation of professional agency, which is based on the concept of professional identity, in the course of Master's studies.

Methodology and Procedure

The goal of research was to analyze the development of professionally relevant personality traits of students in educational psychology Master's programs, which was expected to have irregular and contradictory patterns. The two-round study involved Master's degree students at Moscow State University of Psychology and Education. Both rounds used Lydia Schneider's personal and professional identity di-

agnostic methods, L. Michelson's communicative competence test adapted by Yuri Gilbukh, and Albert Mehrabian and Norman Epstein's empathy scale.

Professional identity diagnostic method is an association test designed to determine the status of professional identity (foreclosed, diffused, achieved, pseudo-positive, and moratorium). The method is based on the framework proposed by Lydia Schneider. Since professional identity is regarded as a personality-related phenomenon, it should be studied in conjunction with personal identity. Personal identity diagnostic method also represents an association test that measures the identical statuses of personal identity. The method is based on Schneider's interpretation of the construct: "Personal identity is self-referentiality, i.e. the sense and perception of the uniqueness of *I* in its existence and individuality of personality traits, while feeling as part of social reality" [Schneider 2007:64]. Mehrabian and Epstein's empathy scale was used to monitor changes in students' empathy, and Gilbukh's adaptation of Michelson's communicative competence test was used to measure changes in communicative competence.

The first round involved 60 students (20 in the 2nd year and 40 in the 1st year) in Educational Psychology Master's programs. The second round involved 35 Master's degree students aged 23 to 42 (26 women and nine men). Five assessments were administered for the whole period: in November 2017 (at entry), February 2018 (end of the 1st semester), June 2018 (end of the 1st year), January 2019 (end of the 3rd semester), and April–May 2019 (end of the program). Data was collected by means of questionnaires distributed among groups and analyzed using the SPSS23.0 software package.

Results Results of the first round were published earlier [Ermolaeva, Isaev, Lubovsky 2020]. The most important findings include the relatively low percentage of graduands with achieved professional identity (35% of the total sample) and achieved personal identity (15% of the total sample) as well as the prevalence of diffuse and pseudo-positive personal identity statuses, characterized by reluctance to change, a low level of reflection, and a positive overall self-concept. The present publication zeroes in on the results of the second round of the study.

Professional identity status is regarded here as one of the most important personality-related learning outcomes. Table 1 presents data on the changes in professional identity status.

Statistical analysis shows that differences among the assessments are insignificant (χ^2=20.379; p=0.204), but the distribution changes essentially between the 1st and the 3rd assessments (Table 2).

Changes in the professional identity status distribution between the 1st and the 3rd assessments, i.e. during the 1st year of Master's studies, are statistically significant (χ^2=9.822; p=0.044). In other words, the most widespread professional identity statuses at the end of the

Table 1. **Changes in professional identity status
during Master's studies.**

Assessment	Professional identity status					Total
	Foreclosed	Diffuse	Moratorium	Achieved	Pseudo-positive	
1	9	8	6	9	3	35
2	5	9	11	5	5	35
3	3	10	12	3	7	35
4	3	12	12	5	3	35
5	3	14	5	9	4	35

Table 2. **Changes in professional identity status
during the 1st year of Master's studies.**

Assessment	Professional identity status					Total
	Foreclosed	Diffuse	Moratorium	Achieved	Pseudo-positive	
1	9	8	6	9	3	35
3	3	10	12	3	7	35

1st year were diffusion, "…in which an individual has no definite commitments and does not engage with exploring their identity" [Schneider 2007], and moratorium, characterized by active attempts to overcome the crisis of professional identity and by a level of exploration typical of people with achieved professional identity. By the end of Master's studies, achieved professional identity status becomes more common (nine graduands), but diffusion gains the overwhelming majority (14).

Changes in personal identity during Master's studies are also of great interest as an indicator of formation of personality-related learning outcomes (Table 3).

No significant differences in data from five assessments were revealed (χ^2=15.584; p=0.482). Remarkably though, diffused identity and moratorium statuses prevail at the beginning of the studies. Master's students with achieved and moratorium personal identity status become the largest groups (10 students in each) at the end of the 1st year, i. e. when moratorium and diffusion statuses come to prevail in professional identity. By the end of Master's studies, the highest percentages in the distribution belong to moratorium, diffused, and pseudo-positive identity statuses (10 students in each group).

A noticeable surge is observed in the development of empathy as a professionally relevant trait (Table 4).

Table 3. **Changes in personal identity status during Master's studies.**

Assessment	Personal identity status					Total
	Foreclosed	Diffuse	Moratorium	Achieved	Pseudo-positive	
1	4	11	11	4	5	35
2	4	9	12	4	6	35
3	1	7	10	10	7	35
4	1	8	14	8	4	35
5	2	10	10	3	10	35

Table 4. **Changes in empathy during Master's studies**

Assessment	Level of empathy				Total
	Very high	High	Normal	Low	
1	1	9	23	2	35
4	10	24	1	0	35

During Master's studies, the most prominent differences in the distribution among levels of empathy are observed between the 1st and the 4th assessments ($\chi^2 = 36.348$; $p = 0.000$), although the largest increase in the total score on Mehrabian and Epstein's empathy scale occurs between the 1st and the 2nd assessments ($U_{эмп.} = 154.5$; $p = 0.01$). Finally, another essential shift in the formation of professionally relevant traits in prospective educational psychologists was revealed in communication skills. According to the results of Michelson's communicative competence test, students make a significant progress in responding competently to interlocutor's provocative behavior ($\chi^2 = 17.9048$, $p = 0.00046$), situations when they have to say no ($\chi^2 = 11.8182$, $p = 0.008$), and contact attempts by others ($\chi^2 = 8.837$, $p = 0.03$), which on the whole indicates a progressive trend in the development of students' communication skills during Master's studies.

Discussion   The results obtained in this study confirm and elaborate essentially the findings of the first round, first of all with regard to the levels of professional and personal identity at different stages of education. The cumulative sample of both rounds consisted of 95 participants. Limitations of research are associated with a small sample size and a focus on Master's programs alone. Nevertheless, analysis results allow making some important inferences about the formation of personali-

ty-related learning outcomes in educational psychology Master's programs. Our years-long observations show that people often pursue Master's degrees hoping to find a way out of their personal development crisis. Those observations are confirmed by the small percentage of 1st-year Master's students with achieved personal identity as well as by the changes in personal identity status (see Table 1) during Master's studies. A decline in the prevalence of achieved identity status by the end of the 1st year and an increase in its prevalence among graduands are very likely to indicate the process of losing the old professional identity and finding a new one. This pattern is dissymmetric to that of the percentage of students with achieved personal identity (see Table 2). Chances are, a lot of students unwittingly substitute searching for a new professional identity for finding a new personal one. If that is the case, academic and psychological support is needed most of all at the end of the 1st year, targeting at reflection of positive changes in professional growth, and at the end of the program, targeting at how a student's personality has changed in the course of studies.

Improvements in communicative competence and empathy skills are what is considered as positive learning outcomes in Master's degree programs. On the whole, it is not inappropriate to say that Master's programs are effective for the development of professionally relevant personality traits in prospective educational psychologists. However, for this system to become even more effective, students should be provided academic and psychological support while nurturing their professional identity and finding their new personal identity. Such support may include well-established modern university education practices (reflection seminars in every module, portfolio method, individual and group counseling) as well as formative assessment of personality-related learning outcomes [Norcini, Shea 2016] and psychological support for recent graduates [Ponce et al. 2019] that are extensively used in training of practicing psychologists in the west.

Conclusion   The study shows that Master's studies, on the whole, contribute to the formation of personality-related learning outcomes. In the course of educational psychology Master's programs, students make considerable progress in the development of communicative competence and empathy. These changes can be explained by the structure of educational psychology Master's degree programs, which widely use cooperative learning practices, thus setting a high standard for communication skills in general and listening in particular.

The hypothesis on irregular and contradictory patterns in the development of professionally relevant personality traits in the course of Master's studies was confirmed. Findings allowed identifying the stages of Master's degree education at which students need academic and educational support most of all: the end of the 1st year and

the end of the program. Probably, the practices of formative assessment [Hortigüela Alcalá, Palacios Picos, López Pastor 2019], dialogic feed-forward [Hill, West 2020], and in-semester assessment of academic performance as a function of motivation and self-regulation [Kickert et al. 2019], extensively used in tertiary education abroad, should be adopted by Master's degree programs in Russia—not for the purpose of controlling and evaluating the development of learning outcomes but as tools for getting feedback from students in order to give them timely support. The diagnostic procedure proposed here can be applied in longitudinal studies aimed at enhancing educational effectiveness.

The findings obtained in this study allow outlining hypotheses and avenues for further research. It is yet to be tested whether Master's degree students unwittingly substitute finding a new professional identity for finding a new personal one. Another assumption that needs to be verified is whether academic support for students in Master's programs actually reduces the risk of crisis during studies and contributes to the formation of achieved identity, both professional and personal.

References

Abankina I., Aleskerov F., Belousova V., Zinkovsky K., Petrushchenko S. (2013) Otsenka rezultativnosti universitetov s pomoshchyu obolochechnogo analiza dannykh [Evaluating Performance of Universities Using Data Envelopment Analysis]. *Voprosy obrazovaniya / Educational Studies Moscow*, no 2, pp. 15–48.

Borch I., Sandvoll R., Risør T. (2020) Discrepancies in Purposes of Student Course Evaluations: What Does It Mean to Be "Satisfied"? *Educational Assessment, Evaluation and Accountability*, vol. 32, January, pp. 83–102.

Cruess L. R., Cruess S. R., Boudreau D., Snell L., Steinert Y. (2015) A Schematic Representation of the Professional Identity Formation and Socialization of Medical Students and Residents: A Guide for Medical Educators. *Academic Medicine*, vol. 90, no 6, pp. 718–725.

Curby T., McKnight P., Alexander L. Erchov S. (2020) Sources of Variance in End-of-Course Student Evaluations. *Assessment & Evaluation in Higher Education*, vol. 45, no 1, pp. 44–53.

Ermolaeva M., Isaev E., Lubovsky D. (2020) Razvitie lichnostnykh kachestv studentov v khode obucheniya v magistrature [Personality Trait Development in Psychology Students during the Graduate Course]. *Psikhologicheskaya Nauka i Obrazovanie / Psychological Science and Education*, vol. 25, no 2, pp. 33–43.

Ermolaeva M., Lubovsky D. (2015) Osobennosti vnutrenney pozitsii studentov-psikhologov [Characteristics of the Intrinsic Position of Students of the Psychological Faculty]. *Voprosy Psychologii*, no 3, pp, 58–65.

Fadie H., Oostdam R., Severiens S. E., Zijlstra B. J.H. (2020) Assessing the Professional Identity of Primary Student Teachers: Design and Validation of the Teacher Identity Measurement Scale. *Studies in Educational Evaluation*, vol. 64, March, pp. 1–10.

Hamilton N. W. (2017) *Professional-Identity / Professional-Formation / Professionalism Learning Outcomes: What Can We Learn about Assessment from Medical Education? University of St. Thomas (Minnesota) Legal Studies Re-*

search Paper No 17–06. Available at: https://ssrn.com/abstract=2962461 (accessed 27 September 2020).

Hill J., West H. (2020) Improving the Student Learning Experience through Dialogic Feed-Forward Assessment. *Assessment & Evaluation in Higher Education*, vol. 45, no 1, pp. 82–97.

Hortigüela Alcalá D., Palacios Picos A., López Pastor V. (2019) The Impact of Formative and Shared or Co-Assessment on the Acquisition of Transversal Competences in Higher Education. *Assessment & Evaluation in Higher Education*, vol. 44, no 6, pp. 933–945.

Houseknecht V. E., Roman B., Stolfi A., Borges N. A. (2019) A Longitudinal Assessment of Professional Identity, Wellness, Imposter Phenomenon, and Calling to Medicine among Medical Students. *Medical Science Educator*, vol. 29, no 6, pp. 493–497.

Isaev E. I. (2017) *Vvedenie v psikhologo-pedagogicheskuyu antropologiyu* [Introduction to psychological and pedagogical anthropology]. Moscow: Moscow State University of Psychology and Education (MSUPE).

Ivaniushina V., Alexandrov D., Musabirov I. (2016) Struktura akademicheskoy motivatsii: ozhidaniya i sub"ektivnye tsennosti osvoeniya universitetskogo kursa [The Structure of Students' Motivation: Expectancies and Values in Taking Data Science Course]. *Voprosy obrazovaniya / Educational Studies Moscow*, no 4, pp. 229–250. DOI: 10.17323/1814–9545–2016–4–229–250

Katalinic M. D. (2018) *Professional Identity Differences in Novice Counselors* (PhD Thesis). Hickory, NC: Lenoir-Rhyne University. Available at: https://pdfs.semanticscholar.org/26f8/14d6a6b213ddd44947799d16ba9d251d2469.pdf?_ga=2.148711806.898930533.1593966050–436529524.1593966050 (accessed 27 September 2020).

Kickert R., Meeuwisse M., Stegers-Jager K.M., Koppenol-Gonzalez G.V., Arends L. R., Prinzie P. (2019) Assessment Policies and Academic Performance within a Single Course: The Role of Motivation and Self-Regulation. *Assessment & Evaluation in Higher Education*, vol. 44, no 8, pp. 1177–1190.

Margolis A., Safronova M. (2018) Itogi kompleksnogo proekta po modernizatsii pedagogicheskogo obrazovaniya v Rossiiskoi Federatsii (2014–2017 gg.) [The Project of Modernisation of Teacher Education in the Russian Federation: Outcomes 2014–2017]. *Psikhologicheskaya nauka i obrazovanie / Psychological Science and Education*, vol. 23, no 1, pp. 5–24. DOI:10.17759/pse.2018230101

Miller G. E. (1990) The Assessment of Clinical Skills/Competence/Performance. *Academic Medicine*, Vol. 65 (9 suppl), September, pp. 63–67.

Murat Sozer E., Zeybekoglu Z., Kaya M. (2019) Using Mid-Semester Course Evaluation as a Feedback Tool for Improving Learning and Teaching in Higher Education. *Assessment & Evaluation in Higher Education*, vol. 44, no 7, pp. 1003–1016.

Navodnov V., Motova G., Ryzhakova O. (2019) Sravnenie mezhdunarodnykh reytingov i rezultatov rossiyskogo Monitoringa effektivnosti deyatelnosti vuzov po metodike analiza lig [The Method of League Analysis and Its Application in Comparing Global University Rankings and Russia's University Performance Monitoring]. *Voprosy obrazovaniya / Educational Studies Moscow*, no 3, pp. 130–151. DOI: 10.17323/1814–9545–2019–3–130–151

Norcini J., Shea J. (2016) Assessment of Professionalism and Progress in the Development of a Professional Identity. *Teaching Medical Professionalism: Supporting the Development of a Professional Identity* (eds R. Cruess, S. Cruess, Y. Steinert), Cambridge: Cambridge University, pp. 155–168.

Ponce A. N. et al. (2019) Addressing Concerns in Psychology Training: Consultation on Trainee Development. *Training and Education in Professional Psychology*, vol. 13, no 4, pp. 247–253.

Rubtsov V., Makarovskaya Z., Guruzhapov V., Maksimov L. (2014) Kompetentnos-tno-deyatelnostnyi podkhod k proektirovaniyu i razrabotke novoi modulnoy OPOP issledovatelskoy magistratury «Kulturno-istoricheskaya psikhologi-ya i deyatelnostnyi podkhod v obrazovanii»: napravlenie podgotovki—Psik-hologo-pedagogicheskoe obrazovanie [Competence-Activity Approach to the Design and Development of New Modular Basic Professional Education Program of Research Master Program "Cultural-Historical Psychology and Activity-Based Approach in Education", with Major in Psychological and Ped-agogical Education]. *Psikhologicheskaya nauka i obrazovanie / Psychological Science and Education*, vol. 19, no 3, pp. 127–142.

Shneider L. B. (2007) *Lichnostnaya, gendernaya i professionalnaya identichnost: teoriya i metody diagnostiki* [Personal, Gender and Professional Identity: Theory and Methods of Diagnostics]. Moscow: Moscow Psychological and Social University.

Tuononen T., Parpala A., Lindblom S. (2019) Graduates' Evaluations of Usefulness of University Education, and Early Career Success—a Longitudinal Study of the Transition to Working Life. *Assessment & Evaluation in Higher Education*, vol. 44, no 4, pp. 581–595.

Psychophysiological Approaches to Instructional Design for Immersive Environments

Yu. Eremenko, O. Zalata

Yulia Eremenko
Candidate of Sciences in Economics, Associate Professor, Department of Marketing, Trade and Customs Affairs, V. I. Vernadsky Crimean Federal University. Address: 21/4 Sevastopolskaya St, 295015 Simferopol.
Email: jul_eremenko@mail.ru

Olga Zalata
Candidate of Sciences in Medicine, Associate Professor, Department of Normal Physiology, V. I. Vernadsky Crimean Federal University. Address: 5/7 Lenina Blvd, 295015 Simferopol.
Email: olga_zalata@mail.ru

Abstract. As part of the Digital Learning Environment federal project, school education programs in Russia are expected to implement modern technology, including virtual and augmented reality. The integration of immersive technology in education should be based on research findings about the influence of virtual environments on learning effectiveness. Specific aspects of immersive technology include the sense of presence, interactivity, social interaction and multisensory stimulation, which cumulatively exert quite a controversial influence on learning experience and outcomes. Since little data is available, instructional design decisions are often based on practical or economic considerations.

Therefore, it has become vitally important to use objective methods in assessing the learning content in order to understand its effects on the learner's cognitive and emotional processes immediately involved in the perception and digestion of educational material. Evaluation of virtual learning content in the process of its design and integration is suggested to be based on such parameters as presence, cognitive load, emotional response, social interaction, and the risks of experiencing cybersickness symptoms.

Analysis of literature and the resulting structured set of methodological tools will aid further studies in the field that use psychophysiological research methods to design effective learning content in virtual reality environments.
Keywords: immersive virtual environment, learning, learning content, neurophysiological methods of research.

Immersive technology, creating a sense of embodiment in virtual reality and allowing the user to interact with the surrounding space, information and content, has been applied more and more widely in various spheres of social life.

Virtual reality (VR) is a three-dimensional, computer-generated environment that can be interacted with by a person through full or partial immersion [Selivanov, Selivanova 2014]. VR has been used in such diverse areas of learning as programming, tourism, marketing, medicine, linguistics, etc. It helps making the presentation of educational material more effective, immersing the learner in scenarios that are very hard to create in the real world (e. g. rescue actions in case of fire at a hazardous factory) and providing the opportunity to master new skills, the acquisition of which is associated with risks to other people's health (e. g. sophisticated microsurgical manipulations).

As VR technology has been growing more accessible due to the continuing drop in hardware costs and the emergence of diverse and open content, theoretical research in the field has grown as well. A number of studies explore the opportunities that VR provides in the development of abstract thinking, e. g. in geometry or vector algebra [Hwang, Hu 2013; Roussou, Oliver, Slater 2006; Roussou 2009; Kaufmann, Schmalstieg, Wagner 2009]. Others analyze the use of immersive environments in practical training [Alaraj et al. 2011], endoscopic surgery [van Dongen et al. 2011], engineering education [Ewert et al. 2014; Alhalabi 2016] and neurosurgical training simulators with haptic feedback [Müns, Meixensberger, Lindner 2014]. A lot of researchers study the use of VR in the humanities, such as linguistics [Wang, Newton, Lowe 2005; Lin, Lan 2015] or history [Blanco-Fernández et al. 2014][1].

There are several reasons why VR is an excellent tool for education. First, it can change the abstract into the tangible. This could be especially powerful in the teaching of mathematics. Second, it supports "doing" rather than just observing. Third, it can substitute methods that are desirable but practically infeasible even if possible in reality [Slater, Sanchez-Vives 2016].

Successful application of any innovative technology in education is contingent on its appropriate use in accordance with the educational goals and objectives, but also on the quality of learning environment and instructional design (Figure 1).

VR is a world created by technical means, which is transmitted to a person through their senses. The technical goal of VR is to replace real sense perceptions by the computer-generated ones. If sensory perceptions are indeed effectively substituted, it creates an effect of immersion, i. e. illusion of presence in a virtual world. In education, immersion allows students to acquire learning experience. Immersion is achieved through the technical capabilities of a system, and a subjective correlate of immersion is presence [Slater, Sanchez-Vives 2016].

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[1] Takahashi D. (2019) *Holocaust Memorial Museum Uses Augmented Reality to Make History Visceral*. Available at: https://venturebeat.com/2018/08/31/holocaust-memorial-museum-uses-augmented-reality-to-make-history-visceral/

Figure 1. **The structure of immersive learning environments**
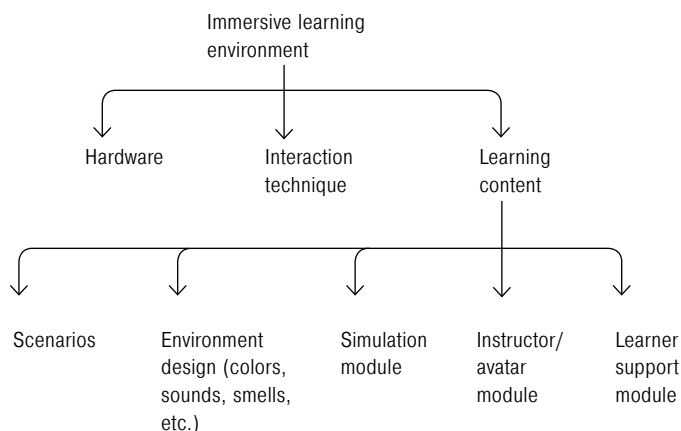
Factors that are critical for successful immersion, or presence, include effective sensory substitution (wide field-of-view vision, stereo, high-resolution displays, etc.), degree of interactivity, multisensory stimulation, emotional response, and social interaction. These factors can be designed to stimulate the necessary cognitive and affective processes in learning.

Available findings indicate that the role of immersive environments in providing interactivity, multisensory stimulation, social interaction and emotional response has a controversial influence on cognitive and affective processes and, consequently, on the learning outcomes.

In particular, mixed results have been reported in studies examining the impact of presence on learning effectiveness. A number of researchers [Bayraktar 2002; Bonde et al. 2014; Clark, Tanner-Smith, Killingsworth 2016; Merchant et al. 2014; Rutten, van Joolingen, van der Veen 2012] have found that low-immersion virtual realities correlate with better cognitive outcomes. A possible reason for this could be that a high level of immersion leads to higher cognitive load and, as a result, less learning [Makransky, Terkildsen, Mayer 2017]. However, there are contradictory findings [Salzman et al. 1999; Lee, Wong, Fung 2010] showing that immersive environments with higher presence levels lead to higher learner engagement and motivation and richer cognitive benefits.

Table 1 provides a summary of findings obtained in a number of studies on how specific parameters of immersive environments affect learning.

There is no doubt that immersive technology can have a significant impact on learning outcomes due to its ample opportunity for simulating emotional experiences, increasing the learner's attention to and interest in the learning content, and allowing them to "live" their educa-

Table **1. The impact of immersive reality parameters on cognitive and emotional processes in learning.**

Parameter/ measure of immersion	Author(s)	Impact on cognitive and emotional processes in learning	Statistical analysis results
Interactivity	[Zhang, Bowman, Jones 2019]	1. Post-tests revealed no significant difference in students' learning gains between VR experiences with different levels of interactivity. 2. Effectiveness of VR learning experiences: in post-tests, the medium interactivity condition was perceived as significantly more effective than the low interactivity condition.	1. Analysis of learning outcomes in three versions of experience 2. $\chi^2(2) = 6{,}107$; $p = 0{,}047$ ($t = -12{,}445$; $p = 0{,}05$)
	[Zha ng et al. 2006]	The post-gain of the group with interactive video was higher than that of the other three groups (with no interaction). A positive correlation between the level of student satisfaction and content interactivity.	1. $F(3, 134) = 9{,}916$; $p = 0{,}00$ 2. $F(3, 134) = 23{,}696$; $p = 0{,}00$
Emotional response	[Allcoat, von Muhlenen 2018]	A significant increase in positive emotions for the VR condition. A significant decrease in positive emotions for the traditional (textbook style) condition.	1. $t(30) = 4{,}73$; $p < 0{,}001$ 2. $t(33) = 4{,}92$; $p < 0{,}001$
Social interaction	[Ravaja et al. 2006]	Playing against a friend or a stranger elicited higher anticipated threat compared to playing against a computer. Spatial presence was higher when playing with a friend or a stranger compared to playing against the computer. Playing with a human elicited higher engagement than playing with a computer. Playing against a human elicited a more positive emotional response compared to playing against a computer.	1. $F(1, 32) = 7{,}55$; $p = 0{,}010$; $\chi^2 = 0{,}19$ 2. $F(1, 32) = 5{,}22$; $p = 0{,}029$; $\chi^2 = 0{,}14$ 3. $F(1, 32) = 17{,}83$; $p = 0{,}001$; $\chi^2 = 0{,}36$ 4. $F(1, 32) = 24{,}19$; $p = 0{,}001$; $\chi^2 = 0{,}43$
Multimedia learning / multisensory stimulation	[Moreno, Mayer 2000]	Students remembered significantly less verbal material in the condition with background music.	($M = 7{,}65$, $SD = 3{,}73$) and ($M = 11{,}37$, $SD = 3{,}29$); $F(1, 71) = 21{,}99$; $MSE = 11{,}61$; $p < 0{,}0001$
	[Kartiko, Kavakli, Cheng 2009]	Application of animated-virtual actors (increased visual complexity) did not affect the learning outcomes.	$\chi^2 (2, N = 200) = 0{,}12$; $p = 0{,}94$

tional experiences. Whether these outcomes are positive or negative depends on the fundamental principles used in instructional design.

As can be seen from Table 1, the most debatable aspect of instructional design is the assessment of cognitive load, which is largely contingent on the levels of multisensory stimulation and interactivity. John

Sweller, the developer of cognitive load theory, contended that cognitive load depended on the amount of information in working memory [Sweller 1998]. Since short-term memory is limited, the teaching methods should not overload it with additional processes that do not contribute to learning directly. Therefore, it is impossible to determine how exactly modern multimedia affect learning outcomes, as they make students process additional sensory information of various types.

The cognitive theory of multimedia learning [Mayer 2009] suggests three types of processing: extraneous processing (which does not support the instructional goal and is caused by poor instructional design or distractions), essential processing (which is aimed at representing the essential presented material in working memory and is caused by the complexity of the material), and generative processing (which is aimed at making sense of the presented material and is caused by the learner's motivation to learn. Given that the learner's cognitive capacity is limited, an excessive amount of sensory stimuli or distractions may have negative effects on the learning outcomes. That is to say, high-immersion virtual environments may significantly increase irrelevant cognitive load.

Cognitive processes are also substantially influenced by emotions, which modulate the selectivity of attention as well as motivate action and behavior [Tyng et al. 2017; Immordino-Yang 2015]. Positive emotions improve performance on tasks requiring creative ingenuity [Isen, Daubman, Nowicki 1987; Fredrickson 2001; Greene, Noice 1988]. Negative emotions have negative effects on learning, directing a student's attention to themselves because they try to find ways to get rid of the bad feeling [Hascher 2010]. Student enjoyment was empirically proven to correlate with self-regulated learning and creative problem solving (0.43, $p < 0.001$) [Goetz et al. 2006].

Since VR technology can elicit a very strong emotion[2], is has great potential for simulating emotional states conducive to effective learning. Intense emotional responses in immersive environments are linked to presence: on one side, the feeling of presence is greater in the "emotional" environments; on the other side, the emotional state is influenced by the level of presence [Riva et al. 2007].

Therefore, the key to effective application of immersive environments in education is the development of fundamental principles of instructional design using psychophysiological methods of assessment that provide the most objective quantitative data on cognitive processes and emotional states. These methods measure unconscious physiological responses to environmental stimuli and allow for real-time data collection.

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[2] Milk C. (2015) *How Virtual Reality Can Create the Ultimate Empathy Machine*. Available at: https://www.ted.com/talks/chris_milk_how_virtual_reality_can_create_the_ultimate_empathy_machine

Table 2. **Psychophysiological assessment methods and vital signs monitored in VR learning environments**

Presence	Cognitive load	Emotional response	Social interaction	VR sickness (cybersickness)
Eye tracking, electrocardiography, electromyography	Eye tracking, electroencephalography, event-related potentials	Eye tracking, electrocardiography, electromyography, electroencephalography, electrodermal activity, functional magnetic resonance imaging, facial coding, respiratory rate, heart rate	Eye tracking, electrocardiography, electromyography, electroencephalography, electrodermal activity, facial coding, respiratory rate, heart rate	electrocardiography, electrodermal activity, facial coding, heart rate

The most important parameters for the assessment of VR learning content include presence, cognitive load, emotional response, social interaction, and VR sickness caused by low-quality content that can lead to dizziness, nausea, high blood pressure, etc.

Table 2 provides an overview of the psychophysiological assessment methods and the vital signs monitored in VR learning environments.

Presence The sense of presence, or "living" a learning experience, is also referred to as the feeling of "being there" or "place illusion". Place illusion can occur in a static environment where nothing happens. When there are events in the environment that respond to the user or correlate with their actions, the user experiences an illusion of plausibility that the events are really happening. In VR learning environments, presence increases the learner's attention, interest and motivation.

Most methods of measuring presence in immersive environments are based on psychological approaches. For example, questionnaires are used to measure such presence parameters as curiosity, concentration, challenge, control, comprehension and emotion [Qin, Pei-Luen, Salvendy 2007]. Full immersion into VR is described by eight major components: clear goals, deep involvement, no concern for the self, alteration of the concept of time, immediate feedback, reasonable chance of completion, sense of control over one's actions, and useful experience [Csikszentmihalyi 1990].

Eye tracking is a commonly used psychophysiological technique measuring the level of immersion. In particular, findings indicate that an increase in immersion causes a significant increase in median star-

tle eyeblink amplitudes [Parsons et al. 2009]. The authors contend that "high-immersion" scenarios evoke a stronger physiological reaction than "low-immersion" scenarios. In immersive learning environments, an individual's number of fixations per second decreases, as their attention becomes more focused [Jennett et al. 2008].

Cognitive load Multisensory and interactive experiences offered by immersive environments can cause cognitive overload. High levels of cognitive load caused by irrelevant cognitive processing may have a negative impact on learning. Electroencephalography, including EEG signals based on event-related potentials, is the most objective measure of cognitive load [Sterman, Mann 1995; Gerjets et al. 2014; Mühl, Jeunet, Lotte 2014; Kumar, Kumar 2016].

An increase in functional brain activity (intense attention or mental effort) suppresses α-band EEG oscillations, stimulating irregular and low-amplitude activity instead. Physiologically, this response is interpreted as desynchronized neural activity and is referred to as "neural desynchronization" or "arousal", depending on the context in which it is recorded. Arousal occurs as a response to a new factor in the environment that requires a different level of orientation [Danilova 2001, Zenkov 2001]. A few studies using digital filters and computer analysis of EEG signals have recorded a special type of activity in the β2 band (35–45 Hz) associated with cognitive processes, in particular active attention and sensorimotor integration [Danilova 2001]. Therefore, typical changes in EEG patterns reflecting the dynamic changes in brain cortex activity may be recommended for use as indicators of mental processes corresponding to the absorption of new information, which is also true for immersive environments.

Eye movement-based analysis of cognitive load [Goldberg, Kotval 1999] reveals a number of patterns. First, more difficult processing is associated with fewer fixations (the brain cannot search for a target when busy doing a cognitive task). Second, longer fixation duration is associated with higher cognitive load (the user spends too much time processing). Third, higher ratios of time spent processing (fixation) to time spent searching (saccade) correlate with higher cognitive load in virtual environments.

Therefore, eye tracking in instructional design allows analyzing and directing the learner's attention, minimizing the distractions, and measuring the learner's attention to and interest in specific content elements in order to improve learning effectiveness.

Emotional response Emotions exert an essential influence on perception, decision making, attention, memory and other cognitive processes that are critical for learning. Automated emotion quantification and recognition is called affective computing. This methodology combines knowledge

from psychophysiology, computer science, biomedical engineering and artificial intelligence. Two approaches to emotion modelling have commonly been proposed in psychology: discrete and dimensional models. The former posits the existence of small innate sets of basic, universally expressed emotions, such as happiness, anger, irritation, etc. Dimensional models consider a continuous multidimensional space where each dimension stands for a fundamental property common to all emotions. Two of the most accepted dimensions are valence (i. e. pleasure, positive versus negative affect) and arousal (low versus high level of activation).

The past two decades have seen the arrival of new neuro- and psychophysiological techniques for studying emotional processing and its neural correlates. Several computational methods for emotion recognition based on variables associated with the central nervous system have been proposed, the most widespread one being EEG, which allows measuring emotion valence and intensity. A wider class of affective computing methods are based on changes in the autonomic nervous system. These include heart rate variability (HRV) analysis, electrocardiography (ECG), electromyography (EMG), electrodermal activity (EDA), eye tracking, and facial expression coding.

Combinations of methods provide more reliable and objective data. For instance, a new methodology for the automatic assessment of emotional responses based on ECG, EDA and respiration activity (RSP) was proposed. Results show that, when nonlinearly extracted features are used, the percentages of successful recognition dramatically increase [Valenza, Lanata, Scilingo 2012]. Another emotion recognition system based on physiological signals uses ECG and RSP data [He, Yao, Ye 2017]. In this study, a support vector machine (SVM) method was applied, which achieved a recognition accuracy of 81.82, 63.64, 54.55, and 30.00% for joy, sadness, anger, and pleasure, respectively. An emotion recognition system for affective states involving the recording of EEG and ECG signals was proposed, the model's accuracy being 75.00% along the arousal dimension and 71.21% along the valence dimension [Marín-Morales et al. 2018].

Emotion recognition using eye tracking is largely based on measuring variations in the diameter of the pupillary aperture of the eye (pupillometry) [Granholm, Steinhauer 2004; Steinhauer et al. 1983]. Pupil dilation is normally associated with viewing pleasant pictures [Bradley et al. 2008]. However, not only emotion or sympathetic activation in response to stress, but an increase in cognitive load, attentional allocation or working memory maintenance as well can result in pupil dilation.

Facial coding is based on specific motion recognition and identification algorithms. Facial coding technology normally implies an algorithm of three steps: (i) automatic face detection using the Viola–Jones cascade classifier; (ii) detection of characteristic facial features within the detected face using such landmarks as eyes, eye and

Table 3. **An example of presenting the output of an emotion recognition algorithm (Microsoft Azure)**

Numeric values	Interpretation
Output 1: 0.001000087;0.050074505;0;0;0.001000474; True; Output 2: 0;0;0;0;0,8; True; Output 3: 0;0;0;0;0; False	Anger Contempt Disgust Fear Happiness True—data recorded False—data not recorded

*identification of the respective emotion in a photo corresponds to a value between 0 and 1.

mouth corners, nose tip, mouth shape, etc.; and (iii) identification of characteristic features, or translation of facial features into metrics [Yarosh et al. 2020]. An example of this technology is Microsoft Azure (Table 3), which offers cloud-based algorithms for face detection, recognition and analysis [Eremenko, Ulanovskaya 2020].

Emotion recognition based on facial coding has been quite a success. For example, matching scores of 89% were reported for recognition of facial expressions when validating FaceReader[3], automated facial coding software [Lewinski, Uyl, Butler 2004].

Social interaction   "Eye-to-eye" interaction is a critical component of learning that can make statements sound more approving, supportive or credible.

There has been little research on social interaction in VR learning environments. Most of the available studies explore social interaction in online games or in "communication" with computer avatars as well as the perception of avatars, e. g. the influence of the type of opponent in video games (computer, friend, or stranger) on presence, emotional reactions and threat and challenge appraisals [Ravaja et al. 2006]. Analysis of EDA and facial EMG activity as well as self-reported perceptions indicate that playing with a friend elicits more arousal and positive valence than playing with a stranger. The presence of another person increases player involvement and enthusiasm, prompting them to choose a higher level of difficulty.

Psychophysiological methods have been used to examine social interaction involving three-dimensional digital human representations—virtual human avatars or computer "agents". In particular, interpersonal distance was found to be regulated by participant gender, perceived avatar gender, and mutual gaze behavior [Bailenson, Blas-

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[3] https://www.noldus.com/facereader

covich, Beall 2003]. The authors introduced the concept of "digital chameleon" (the chameleon effect): participants showed more preference to and kept the smallest interpersonal distance with the avatars that mimicked their own nonverbal behavior. People were also more likely to choose to be represented by anthropomorphic avatars that matched their gender and race [Nowak, Rauh 2005].

VR sickness   Learning content of poor quality inhibits the absorption of educational material. In extreme cases, it causes VR sickness (cybersickness), which may involve dizziness, nausea, high blood pressure and increased heart rate. A questionnaire proposed to measure cybersickness consisted of 16 questions about symptoms, which were divided into three main categories: (1) nausea (general discomfort, increased salivation, sweating, nausea, difficulty concentrating), (2) oculomotor symptoms (general discomfort, fatigue, headache, eyestrain, difficulty concentrating, blurred vision); and (3) disorientation (difficulty focusing, nausea, blurred vision, dizziness with eyes open/closed) [Kennedy et al. 1993].

Post-tests are used to assess the overall body reaction to virtual learning content, and psychophysiological methods allow identifying what exactly and when caused the discomfort and symptoms of cybersickness. This is achieved by monitoring the EDA signals, hemodynamic metrics (blood pressure and heart rate), and respiratory rate and rhythm. Symptoms of cybersickness and changes of brain regional activity were investigated using EEG-based source localization, before and after a VR experience involving a smartphone-assisted head mount display [Kim et al. 2019].

Hemodynamic metrics are good indicators of stress. For example, an analysis of systolic and diastolic blood pressure as well as heart rate before and after a VR and hypermedia-based learning experience revealed an increase in blood pressure in VR learning environments, which may indicate an increased sympathetic tone of the autonomic nervous system that mediates response to stress—in this case a new format of learning. Meanwhile, learning in hypermedia-based environments, more familiar to students, showed a decrease in blood pressure, which may indicate less strain in the sympathetic division of the nervous system [Astafurov et al. 2020].

Neurophysiological techniques have been applied successfully in instructional design. Assessment of the learning content may be performed before, during and after the interaction, which is an undeniable advantage of such methods.

Table 4 presents the most accessible tools for neurophysiological research—metrics and their interpretation.

Therefore, objective psychophysiological methods can be used to achieve strategic and tactical goals in VR instructional design. Strategically, they allow evaluating the feasibility of innovative education-

Table 4. **Methods and metrics of VR instructional design assessment.**

Cognitive and affective processes	Neurophysiological methods of measurement	Metrics	Interpretation	Applications
Attention and interest	Video-oculography	Oculomotor activity metrics		Managing the learner's active attention to and interest in the learning content. The optimal response criteria include maintained interest and patterns of visual attention typical of effective learning
		Heat maps	Color contrasts are used to demonstrate areas of visual attention and interest	
		Time to first fixation (TTFF)	Describes the process of searching for the area of interest, i. e. which parts of the visual stimulus are of priority to the observer	
		Ratio of first fixation duration to TTFF	A short TTFF and a long first fixation duration indicate that the visual object is highly attractive	
		Saccades	The number of saccades increases when viewing uninteresting content [Grobelny et al. 2006]	
		Fixations	Refixations indicate the number of times the person revisits the area of interest	
		Blink rate	A low blink rate indicates a high level of concentration [Yarosh et al. 2020]	
	EEG	Changes in the typical EEG power spectral frequencies	Theta rhythm is used to measure the level of interest in the presented material	
Emotions	Automated facial coding	Metrics for the automatic emotion recognition based on analysis of typical facial features	Identification of emotions: joy, fear, anger, surprise, contempt	Modelling the desired emotional states in learning
Cognitive load	EEG	Changes in the typical EEG power spectral frequencies	Indicators of cognitive processes: neural desynchronization; increase in the high-frequency bands of the EEG power spectrum (beta-1 and beta-2 rhythms)	Achieving an optimal level of cognitive load for VR learning environments. Neural desynchronization is considered the criterion for optimal response in EEG patterns of learners in immersive environments
	Video-oculography	Oculomotor activity metrics		
		Fixations	Duration of fixation is dependent on how easy or difficult the display is to process [Renshaw et al. 2004]. The number of fixations increases in high cognitive load scenarios [Grobelny et al. 2006]	
		Pupillary response	Pupil dilation is associated with higher cognitive load [Poole, Ball, Phillips 2006]	
VR sickness	Arterial tonometry with pulse (heart rate) measurement	Hemodynamic metrics (systolic and diastolic blood pressure, heart rate)	Emotional stress assessment based on changes in blood pressure and heart rate (increased BP and HR)	Identifying and preventing the symptoms of VR sickness in immersive learning environments. A maximum increase of 10% in heart rate and blood pressure is considered the criteria for optimal hemodynamic response

al technology and discriminating between efficient learning tools and fashion statements. Tactically, psychophysiological techniques may be used for elaborating the fundamental principles of effective VR instructional design, assessing the level of physical and psychological comfort in immersive environments with the help of various devices, and analyzing the individual behavior of students in VR learning environments.

Conclusion This review of literature on the impact of virtual environments on learning effectiveness shows that the study of such VR parameters as presence, interactivity, social interaction and multisensory stimulation should be focused on assessing the quality of knowledge acquired in such environments as well as the risks of experiencing cybersickness symptoms.

Objectiveness in assessing the impact of immersive environments on the quality of learning can be provided by a broad range of psychophysiological measures (eye movement tracking, electroencephalography, electrocardiography, electromyography, functional magnetic resonance imaging, etc.) and physiological parameter monitoring in field experiments. It may be recommended to record a minimum of three vital signs reflecting the level of active attention, cognitive load and the risks of experiencing VR sickness symptoms to optimize psychophysiological observations.

VR instructional design assessment using objective psychophysiological methods at the stage of development will contribute to the integration of state-of-the-art technology in online education and improve learning effectiveness.

References Alaraj A., Lemole M. G., Finkle J. H. et al. (2011) Virtual Reality Training in Neurosurgery: Review of Current Status and Future Applications. *Surgical Neurology International*, vol. 2, Art. no 52. DOI:10.4103/2152–7806.80117

Alhalabi W. S. (2016) Virtual Reality Systems Enhance Students' Achievements in Engineering Education. *Behaviour & Information Technology*, vol. 35, no 11, pp. 919–925. http://doi.org/10.1080/0144929X.2016.1212931

Allcoat D., von Muhlenen A. (2018) Learning in Virtual Reality: Effects on Performance, Emotion and Engagement. *Research in Learning Technology*, vol. 26, November. Art. no 2140. DOI: 10.25304/rlt.v26.2140

Astafurov D., Verbenko P., Dorozhkin R., Zhukova A., Izmailov E., Kravchenko A., Prasolov N., Sereda E. (2020) Kharakteristika fiziologicheskikh i psikhologicheskikh reaktsiy u studentov pri predyavlenii informatsionnogo kontenta v srede virtualnoy realnosti [Characteristics of Physiological and Psychological Reactions of Undergraduates Presented with Information Content in a Virtual Reality]. Proceedings of *Theoretical and Applied Aspects of Modern Medicine, the 92nd International Academic Conference for Students and Young Scientists (Simferopol, April 16, 2020)*, Simferopol: Medical Academy named after S. I. Georgievsky, V. I. Vernadsky Crimean Federal University, pp. 349–351.

Bailenson J., Blascovich J., Beall A. (2003) Interpersonal Distance in Immersive

Virtual Environments. *Personality & Social Psychology Bulletin*, vol. 29, July, pp. 819–833. DOI:10.1177/0146167203029007002

Bayraktar Ş. (2002) A Meta-Analysis of the Effectiveness of Computer-Assisted Instruction in Science Education. *Journal of Research on Technology in Education*, vol. 34, no 2, pp. 173–188. https://doi.org/10.1080/15391523.2001.10782344

Blanco-Fernández Y., López-Nores M., Pazos-Arias J.J., Gil-Solla A., Ramos-Cabrer M., García-Duque J. (2014) REENACT: A Step Forward in Immersive Learning about Human History by Augmented Reality, Role Playing and Social Networking. *Expert Systems with Applications*, vol. 41, no 10, pp. 4811–4828.

Bonde M., Makransky G., Wandall J., Larsen M., Morsing M., Jarmer H., Sommer M. (2014) Improving Biotech Education through gGamified Laboratory Simulations. *Nature Biotechnology*, vol. 32, no 7, pp. 694–697. DOI: 10.1038/nbt.2955

Bradley M. M., Miccoli L., Escrig M. A., Lang P. J. (2008) The Pupil as a Measure of Emotional Arousal and Autonomic Activation. *Psychophysiology*, vol. 45, no 4, pp. 602–607.

Calvo R.A, D'Mello S. (2010) Affect Detection: An Interdisciplinary Review of Models, Methods, and their Applications. *IEEE Transactions on Affective Computing*, vol. 1, no 1, pp. 18–37. DOI: 10.1109/T-AFFC.2010.1

Clark B. D., Tanner-Smith E.E., Killingsworth S. S. (2016) Digital Games, Design, and Learning: A Systematic Review and Meta-Analysis. *Review of Educational Research*, vol. 86, no 1, pp. 79–122. https://doi.org/10.3102/0034654315582065

Csikszentmihalyi M. (1990) *Flow: The Psychology of Optimal Experience*. New York: Basic Books.

Danilova N. (2001) *Psikhofiziologiya* [Psychophysiology], Moscow: Aspekt.

Dongen van K.W., Ahlberg G., Bonavina L. et al. (2011) European Consensus on a Competency-Based Virtual Reality Training Program for Basic Endoscopic Surgical Psychomotor Skills. Surgical Endoscopy, vol. 25, no 1, pp. 166–171. DOI:10.1007/s00464–010–1151–6

Eremenko Ju., Ulanovskaya O. (2020) Sovremennye metody i tekhnologii prikladnogo neyromarketinga [Modern Methods and Technologies of Applied Neuromarketing]. *Journal of Marketing in Russia and Abroad*, no 2, pp. 37–45.

Ewert D., Schuster K., Johansson D., Schilberg D., Jeschke S. (2014) Intensifying Learner's Experience by Incorporating the Virtual Theatre into Engineering Education. *Automation, Communication and Cybernetics in Science and Engineering 2013/2014* (eds S. Jeschke, I. Isenhardt, F. Hees, and K. Henning), Heidelberg, New York, Dordrecht, London: Springer, pp. 255–267.

Fredrickson B. L. (2001) The Role of Positive Emotions in Positive Psychology. *American Psychologist*, vol. 56, no 3, pp. 218–226. http://dx.doi.org/10.1037/0003–066X.56.3.218

Friedman D., Steed A., Slater M. (2007) Spatial Social Behavior in Second Life. *Intelligent Virtual Agents. IVA 2007. Lecture Notes in Computer Science. Vol. 4722.* (eds C. Pelachaud, J. C. Martin, E. André, G. Chollet, K. Karpouzis, D. Pelé), Berlin, Heidelberg: Springer, pp. 252–363. https://doi.org/10.1007/978–3–540–74997–4_23

Gerjets P., Walter W., Rosenstiel W., Bogdan M., Zander T. O. (2014) Cognitive State Monitoring and the Design of Adaptive Instruction in Digital Environments: Lessons Learned from Cognitive Workload Assessment Using a Passive Brain-Computer Interface Approach. *Frontiers in Neuroscience*, vol. 8, Art. no 386. DOI: 10.3389/fnins.2014.00385

Goetz T., Hall N. C., Frenzel A. C., Pekrun R. (2006) A Hierarchical Conceptualization of Enjoyment in Students. *Learning and Instruction*, vol. 16, no 4, pp. 323–338. DOI: 10.1016/j.learninstruc.2006.07.004

Goldberg J. H., Kotval X. P. (1999) Computer Interface Evaluation Using Eye Movements: Methods and Constructs. *International Journal of Industrial Ergonomics*, vol. 24, no 6, pp. 631–645.

Granholm E., Steinhauer S. R. (2004) Pupillometric Measures of Cognitive and Emotional Processes. *International Journal of Psychophysiology*, vol. 52, no 1, pp. 1–6.

Greene T., Noice H. (1988) Influence of Positive Affect upon Creative Thinking and Problem Solving in Children. *Psychological Reports*, vol. 63, no 3, pp. 895–898.

Grobelny J., Jach K., Kuliński M., Michalski R. (2006) *Śledzenie wzroku w badaniach jakości użytkowej oprogramowania. Historia i mierniki* [Tracking of Eye Movements in Studies of Software Quality. History and Measurement Methods]. Paper presented at Interfejs użytkownika—Kansei w praktyce Conference (Warszawa 2006). (Unpublished).

Hascher T. (2010) Learning and Emotion: Perspectives for Theory and Research. *European Educational Research Journal*, vol. 9, no 1, pp. 13–28.

He C., Yao Y., Ye X. (2017) An Emotion Recognition System Based on Physiological Signals Obtained by Wearable Sensors. *Wearable Sensors and Robots. Lecture Notes in Electrical Engineering. Vol. 399* (eds C. Yang, G. Virk, H. Yang), Singapore: Springer, pp. 15–25.

Hwang W.-Y., Hu S.-S. (2013) Analysis of Peer Learning Behaviors Using Multiple Representations in Virtual Reality and their Impacts on Geometry Problem Solving. *Computers & Education,* vol. 62, March, pp. 308–319. DOI:10.1016/j.compedu.2012.10.005

Immordino-Yang M.H. (2015) *Emotions, Learning and the Brain: Exploring the Educational Implications of Affective Neuroscience*. New York: W. W. Norton & Co.

Isen A. M., Daubmann K., Nowicki G. (1987) Positive Affect Facilitates Creative Problem Solving. *Journal of Personality and Social Psychology*, vol. 52, no 6, pp. 1122–1131. http://dx.doi.org/10.1037/0022–3514.52.6.1122

Jennett Ch., Cox A. L., Cairns P., Dhoparee S., Epps A., Tijs T., Walton A. (2008) Measuring and Defining the Experience of Immersion in Games. *International Journal of Human-Computer Studies*, vol. 66, no 9. P. 641–661. DOI: 10.1016/j.ijhcs.2008.04.004

Kartiko I, Kavakli M., Cheng K. (2010) Learning Science in a Virtual Reality Application: The Impacts of Animated-Virtual Actors' Visual Complexity. *Computers & Education*, vol. 55, no 2, pp. 881–891.

Kaufmann H., Schmalstieg D., Wagner M. (2009) Construct 3D: A Virtual Reality Application for Mathematics and Geometry Education. *Education and Information Technologies*, vol. 5, iss. 4, pp. 263–276.

Kennedy R. S., Lane N. E., Berbaum K. S., Lilienthal M. G. (1993) Simulator Sickness Questionnaire: An Enhanced Method for Quantifying Simulator Sickness. *The International Journal of Aviation Psychology*, vol. 3, no 3, pp. 203–220. DOI: 10.1207/s15327108ijap0303_3

Kim J.-Y., Son J.-B., Lee H.-S., Lee S.-H. (2019) Psychophysiological Alteration after Virtual Reality Experiences Using Smartphone-Assisted Head Mount Displays: An EEG-Based Source Localization Study. *Applied Sciences*, vol. 9, no 12, Art. no 2501. DOI:10.3390/app9122501

Kumar N., Kumar J. (2016) Measurement of Cognitive Load in HCI Systems Using EEG Power Spectrum: An Experimental Study. *Procedia—Computer Science*, vol. 84, December, pp. 70–78.

Lee E. A.-L., Wong K. W., Fung C. C. (2010) How Does Desktop Virtual Reality Enhance Learning Outcomes? A Structural Equation Modeling Approach. *Computers & Education*, vol. 55, no 4, pp. 1424–1442. http://doi.org/10.1016/j.compedu.2010.06.00

Lewinski P., Uyl T., Butler C. (2014) Automated Facial Coding: Validation of Basic Emotions and FACS AUs in FaceReader. *Journal of Neuroscience, Psychology, and Economics*, vol. 7, no 4, pp. 227–236.

Lin T.-J., Lan K. (2015) Language Learning in Virtual Reality Environments: Past, Present, and Future. *Educational Technology & Society*, vol. 18, no 4, pp. 486–497.

Makransky G., Terkildsen Th.S., Mayer R. E. (2017) Adding Immersive Virtual Reality to a Science Lab Simulation Causes More Presence but Less Learning. *Learning and Instruction*, Vol. 60, April, pp. 225–236.

Marin-Morales J., Higuera-Trujillo J.L., Greco A., Guixeres J. (2018) Affective Computing in Virtual Reality: Emotion Recognition from Brain and Heartbeat Dynamics Using Wearable Sensors. *Scientific Reports*, vol. 8, no 1, Art. no 3657. DOI: 10.1038/s41598–018–32063–4

Mayer R. E. (2014) Cognitive Theory of Multimedia Learning. *The Cambridge Handbook of Multimedia Learning* (ed. R. E. Mayer), New York: Cambridge University, pp. 43–71.

Merchant Z., Goetz E., Cifuentes L., Keeney-Kennicutt W. Davis T. (2014) Effectiveness of Virtual Reality-Based Instruction on Students' Learning Outcomes in K-12 and Higher Education: A Meta-Analysis. *Computers & Education*, vol. 70, no 1, pp. 29–40. DOI: 10.1016/j.compedu.2013.07.033

Moreno R., Mayer R. E. (2000) A Coherence Effect in Multimedia Learning: The Case for Minimizing Irrelevant Sounds in the Design of Multimedia Messages. *Journal of Educational Psychology*, vol. 92, no 1, pp. 117–125.

Mühl Ch., Jeunet C., Lotte F. (2014) EEG-Based Workload Estimation across Affective Contexts. *Frontiers in Neuroscience*, vol. 8, Art. no 114.

Müns A., Meixensberger J., Lindner D. (2014) Evaluation of a Novel Phantom-Based Neurosurgical Training System. *Surgical Neurology International*, vol. 5, Art. no 173. DOI:10.4103/2152–7806.146346

Nowak K., Rauh Ch. (2005) The Influence of the Avatar on Online Perceptions of Anthropomorphism, Androgyny, Credibility, Homophily, and Attraction. *Journal of Computer-Mediated Communication*, vol. 11, no 1, pp. 153–178. DOI:10.1111/j.1083–6101.2006.tb00308.x

Parsons Th.D., Iyer A., Cosand L., Courtney Ch., Rizzo A. A. (2009) *Neurocognitive and Psychophysiological Analysis of Human Performance within Virtual Reality Environments.* Paper presented at the 17th Annual Medicine Meets Virtual Reality (MMVR17) (Long Beach, CA, January 19–22, 2009). DOI:10.3233/978–1–58603–964–6–247

Pausch R., Proffitt D., Williams G. (1997) Quantifying Immersion in Virtual Reality. Proceedings of the *24th Annual Conference on Computer Graphics and Interactive Techniques (Los Angeles, August 03–08, 1997), SIGGRAPH '97*, New York, NY: ACM Press/Addison-Wesley, pp. 13–18.

Picard RW. (1997) *Affective Computing*. Cambridge: MIT.

Poole A., Ball L. J., Phillips P. (2004) In Search of Salience: A Response-Time and Eye-Movement Analysis of Bookmark Recognition. Proceedings of *HCI 2004. People and Computers XVIII—Design for Life* (eds S. Fincher, P. Markopolous, D. Moore, R. Ruddle), London: Springer-Verlag Ltd, pp. 363–378.

Qin H., Pei-Luen P.R., Salvendy G. (2007) Player Immersion in the Computer Game Narrative. Proceedings of the *6th International Conference □Entertainment Computing—ICEC2007□ (Shanghai, China, September 15–17, 2007)*, pp. 458–461.

Ravaja N., Saari T., Turpeinen M., Laarni J., Salminen M., Kivikangas M. (2006) Spatial Presence and Emotions during Video Game Playing: Does It Matter with Whom You Play? *Presence: Teleoperators & Virtual Environments*, vol. 15, no 4, pp. 381–392.

Renshaw J. A., Finlay J. E., Tyfa D, Ward R. D. (2004) Understanding Visual Influence in Graph Design through Temporal and Spatial Eye Movement Characteristics. *Interacting with Computers*, vol. 16, iss. 3, pp. 557–558.

Riva G., Mantovani F., Capideville C.S, Preziosa A., Morganti F, Villani D., Gaggioli A., Botella C., Alcañiz M. (2007) Affective Interactions Using Virtual Reality: The Link between Presence and Emotions. *CyberPsychology & Behavior*, vol. 1, no 1, pp. 45–56. http://doi.org/10.1089/cpb.2006.9993

Roussou M. (2009) A VR Playground for Learning Abstract Mathematics Concepts. *IEEE Computer Graphics and Applications,* vol. 29, no 1, pp. 82–85. DOI:10.1109/MCG.2009.1

Roussou M., Oliver M., Slater, M. (2006) The Virtual Playground: An Educational Virtual Reality Environment for Evaluating Interactivity and Conceptual Learning. *Virtual Reality*, vol. 10, no 3, pp. 227–240. DOI:10.1007/s10055–006–0035–5

Rutten N. P.G., van Joolingen W., van der Veen J. T. (2012) The Learning Effects of Computer Simulations in Science Education. *Computers & Education*, vol. 58, no 1, pp. 136–153. https://doi.org/10.1016/j.compedu.2011.07.017

Salzman M. C., Dede C., Loftin R. B., Chen J. (1999) A Model for Understanding How Virtual Reality Aids Complex Conceptual Learning. *Presence: Teleoperators and Virtual Environments*, vol. 8, no 3, pp. 293–316. http://doi.org/10.1162/105474699566242

Selivanov V., Selivanova L. (2014) Virtualnaya realnost kak metod i sredstvo obucheniya [Virtual Reality as a Method and Means of Learning]. *Obrazovatelnye tekhnologii i obshchestvo*, vol. 17, no 3, pp. 378–391.

Slater M., Sanchez-Vives M.V. (2016) Enhancing our Lives with Immersive Virtual Reality. *Frontiers in Robotics and AI*, vol. 3, December, Art. no 74.

Steinhauer S. R., Boller F., Zubin J., Pearlman S. (1983) Pupillary Dilation to Emotional Visual Stimuli Revisited. *Psychophysiology*, vol. 20, pp. 472.

Sterman M. B., Mann C. A. (1995) Concepts and Applications of EEG Analysis in Aviation Performance Evaluation. *Biological Psychology*, vol. 40, no 1–2, pp. 115–130.

Sweller J. (1998) Cognitive Load during Problem Solving: Effects on Learning. *Cognitive Science*, vol. 12, iss. 2, pp. 257–285. https://doi.org/10.1207/s15516709cog1202_4

Tyng Chai M., Hafeez U. Amin, Mohamad N. M. Saad, Malik Aamir S. (2017) The Influences of Emotion on Learning and Memory. *Frontiers in Psychology*, vol. 8, Art. no 1454.

Valenza G., Lanata A., Scilingo E. P. (2012) The Role of Nonlinear Dynamics in Affective Valence and Arousal Recognition. *IEEE Transactions on Affective Computing*, vol. 3, no 2, pp. 237–249. DOI: 10.1109/T-AFFC.2011.30

Wang R., Newton S., Lowe R. (2015) Experiential Learning Styles in the Age of a Virtual Surrogate. *Archnet-IJAR: International Journal of Architectural Research*, vol. 9, iss. 3, pp. 93–110. https://doi.org/10. 26687/archnet-ijar.v9i3.715

Yarosh O., Kalkova N., Velgosh N., Eremenko Y., Mitina E. (2020) *Vizualny neyromarketing: fundamentalnye i prikladnye issledovaniya* [Visual Neuromarketing: Fundamental and Applied Research], Simferopol: Arial.

Zenkov L. (2001) *Klinicheskaya elektroentsefalografiya (s elementami epileptologii)* [Clinical Electroencephalography (With Elements of Epileptology)], Moscow: MEDpress-inform.

Zhang D., Bowman A., Jones C. N. (2019) Exploring Effects of Interactivity on Learning with Interactive Storytelling in Immersive Virtual Reality. Proceedings of the *11th International Conference on Virtual Worlds and Games for Serious Applications (VS-Games) (Vienna, Austria, September 04–06, 2019)*, pp. 1–8. DOI: 10.1109/VS-Games.2019.8864531

Zhang D., Zhou L., Briggs R., Nunamaker J. F. (2006) Instructional Video in e-Learning: Assessing the Impact of Interactive Video on Learning Effectiveness. *Information and Management*, vol. 43, no 1, pp. 15–27.

School Staffing: Teachers' Perceptions

Authors

Tatyana Klyachko
Doctor of Sciences in Economics, Director of the Center for Lifelong Learning Economics, Institute of Applied Economic Research, Russian Presidential Academy of National Economy and Public Administration (RANEPA).
E-mail: tlk@ranepa.ru

Elena Semionova
Candidate of Sciences in Economics, Leading Researcher, Center for Lifelong Learning Economics, Institute of Applied Economic Research, Russian Presidential Academy of National Economy and Public Administration (RANEPA).
E-mail: semionova-ea@ranepa.ru

Galina Tokareva
Research Fellow, Center for Lifelong Learning Economics, Institute of Applied Economic Research, Russian Presidential Academy of National Economy and Public Administration (RANEPA). E-mail: tokareva-gs@ranepa.ru

Address: 82 Vernadskogo Ave, 119571 Moscow, Russian Federation.

Abstract

Teachers play a key role in achieving the national policy goals in secondary education, in particular in improving students' outcomes. The ongoing changes of the recent years inevitably affect the functions and working conditions of school teachers. Surveys of teachers' perceptions of self and of the current situation and development prospects in secondary education should become a required element in the design of national education policies.

This study was based on the results of the Monitoring of Secondary Education conducted by the Center for Lifelong Learning Economics (Institute of Applied Economic Research, Russian Presidential Academy of National Economy and Public Administration) in Novgorod Oblast, Nizhny Novgorod Oblast and Tula Oblast in 2020. The survey was administered in early March, prior to the emergency transition to remote online education due to the SARS-CoV-2 pandemic. For this reason, the article reflects little to no transformations in teachers' perceptions of their jobs and labor conditions caused by the rapid transition to a different format of teaching. At the same time, the monitoring results can serve as a baseline for analyzing the post-COVID developments in secondary education.

Despite the government's measures to refresh the teaching staff in schools, nothing has changed significantly in this regard so far. Teachers often resist massive refreshment initiatives, arguing that such changes would degrade the overall level of teaching competencies within the institution. Young teachers, in their turn, are increasingly more likely to be mismatched to their jobs, looking for additional sources of income within or outside the system, and ready to withdraw anytime. Attraction of youth to school teaching careers should thus be accompanied by managerial solutions for improving school effectiveness in the context of staff refreshment.

Keywords

Monitoring of Secondary Education, sociological study, secondary (school) education, teachers, occupation.

References

Avraamova E., Klyachko T., Loginov D., Semionova E., Tokareva G. (2019) *Monitoring obshchego obrazovaniya: sotsiologicheskie aspekty* [Monitoring of General Education: Sociological Aspects]. Moscow: Delo.

Avraamova E., Tokareva G. (2015) *Obshchee obrazovanie: monitoring effek-tivnosti* [General Education: Performance Monitoring]. Moscow: Delo.

Avraamova E., Klyachko T., Loginov D., Polushkina E., Semionova E., Tokare-va G. (2019) *Uchitelya rossiyskikh shkol: problem i perspektivy. Monitoring effektivnosti shkoly no 3 (8)* [Teachers of Russian Schools: Problems and Prospects. Monitoring of Efficiency of School Education no 3 (8)]. Moscow: RANEPA.

Barber M., Mourshed M. (2007) *How the World's Best-Performing School Systems Come out on Top*. New York: McKinsey and Company.

Byron A., Kihn P., Miller M. (2010) *Closing the Talent Gap: Attracting and Retaining Top-Third Graduates to Careers in Teaching*. New York: McKinsey and Company.

Golovchin M., Soloveva T. (2018) Sotsialnoe i professionalnoe samochustvie uchiteley rossijskikh shkol v period reform i kontrreform [Social and Professional Well-Being of the Russian School Teachers during the Period of Reforms and Counter-Reforms]. *Ideas and Ideals*, vol. 2, no 3, pp. 233–252. DOI:10.17212/2075-0862-2018-3.2-233-252.

Gustafsson J., Nilson T. (2016) The Impact of School Climate and Teacher Quality on Mathematics Achievement: A Difference-in-Differences Approach. *Teacher Quality, Instructional Quality and Student Outcomes. IEA Research for Education* (eds T. Nilson, J. Gustafsson), Cham, Switzerland: Springer, vol. 2, pp. 81–95. Available at: https://link.springer.com/chapter/10.1007/978-3-319-41252-8_4 (accessed 20 September 2020).

Hanushek E. A., Piopiunik M., Wiederhold S. (2019) The Value of Smarter Teachers: International Evidence on Teacher Cognitive Skills and Student Performance. *Journal of Human Resources*, vol. 54, no 4, pp. 857–899.

Khagurov T., Ostapenko A. (2013) *Reforma obrazovaniya glazami uchiteley i prepodavateley: opyt sotsiologicheskogo issledovaniya* [Education Reform through the Eyes of Teachers and Lecturers: The Attempt of Sociological Research]. Moscow; Krasnodar: Parabellum.

Klimenko L., Posukhova O. (2017) Professionalnaya identichnost gorodskikh uchiteley v usloviyakh modernizatsii instituta obrazovaniya [The Professional Identity of Urban Teachers in the Context of Educational Modernization]. *Zhurnal Institutsionalnykh Issledovaniy/Journal of Institutional Studies*, vol. 9, no 2, pp. 138–153. DOI:10.17835/2076-6297.2017.9.2.137-153.

Ladd H. F., Sorenson L. C. (2017) Returns to Teacher Experience: Student Achievement and Motivation in Middle School. *Education Finance and Policy*, vol. 12, no 2, pp. 241–279. Available at: https://www.mitpressjournals.org/doi/10.1162/EDFP_a_00194 (accessed 20 September 2020).

Papay J., Kraft M. (2015) Productivity Returns to Experience in the Teacher Labor Market: Methodological Challenges and New Evidence on Long-Term Career Improvement. *Journal of Public Economics*, vol. 130, iss. C, pp. 105–119.

Pinskaya M., Evstigneeva N., Bysik N., Kosaretsky S., Zvyagintsev R. (2017) *Kak menyayutsya usloviya raboty i professionalnoe samochuvstvie uchiteley? Monitoring of Education Markets and Organizations. Information Bulletin no 14.* Moscow: HSE.

Emperor Nicholas I Orenburg Women's Institute in the Second Half of the 19th–Early 20th Century

M. Varavva

Margarita Varavva
Candidate of Sciences in Economics, Associate Professor, Department of Economics, Social Sciences, and Humanities, Orenburg Branch of Plekhanov Russian University of Economics. Address: 50/51–53 Leninskaya/Pushkinskaya St, 460000 Orenburg, Russian Federation. Email: margur2010@mail.ru

Abstract. Reformation of female education in Russia in the mid-19th century led, among other things, to further evolution of closed class-selective women's institutes of the boarding school type that provided secondary, religious, and secular education of girls. Historical documents and archival sources are used in this article to describe the organization and content of learning in Emperor Nicholas I Orenburg Women's Institute, the largest institution of girls' secondary education in the vast Orenburg Governorate at the end of the 19th century. Institute education had a considerable social value for girls from civil and military middle-class families in the cities and remote suburbs of Orenburg Governorate, as it allowed them not only to acquire general knowledge but also to develop teaching skills that they could use to make a living. Evidence is provided that, given the local context, Emperor Nicholas I Orenburg Women's Institute matched most of the criteria of the institute education model typical of pre-revolutionary Russia, which transformed in response to society's demands concerning female education. Discontinuous interest, insufficient elaboration of the problem, and historical oblivion of valuable local history materials dictated the need to crane out a body of archival sources and reconstruct the process of creating a unique educational phenomenon, which Emperor Nicholas I Orenburg Women's Institute came to be.

Keywords: female education, Office of the Institutions of Empress Maria, women's institutes in provinces of the Russian Empire, socialization of female students, Emperor Nicholas I Orenburg Women's Institute.

The first half of the 19th century was marked by a key process in the life of Russian society—formation of a single educational space embracing the European and Asian parts of the vast empire. Female secondary education, represented by institutes for noble maidens, also underwent a major change. First, institutes of that type expanded dramatically in number and geography: "gradually, under imperial patron-

age, arose new cradles of maidens' education in Russia, even in its most remote corners."[1] Under the auspices of Empress Maria Feodorovna, institutes for noble maidens were springing up abundantly across the empire in the late 18th–first half of the 19th century, depriving Petersburg and Moscow of their monopoly in female secondary education.

Second, the very concept of female education was radically revalued during the period specified. Catherine the Great and Empress Maria Feodorovna had different views of the purpose and ultimate goals of female education. Catherine the Great's perspective was national and large-scale; eager to make women educated and useful members of society, she tried to provide "not only upbringing but also education—general, not confined to any specific 'female' purposes." [Likhacheva 1899:131 (P. 1)] Meanwhile, the goals pursued by Maria Feodorovna were short-term, more narrow and utilitarian. Specifically, women's institutes were meant to raise "good wives, mothers and housewives", who had "no need for sciences or scholarly knowledge", so the "institutes turned into vocational institutions of female education." [Kapterev 1915:245–246] Education obtained by institute graduates was supposed to be regarded as perfectly complete. The idea of self-education and mental development of girls and women was persistently eradicated from the concept of education. As Elena Likhacheva points out, "this aspect was important for achieving the main goal of female education organization, but it was not given top priority by the early initiators of women's institutes. Empress Maria never expressed even a hint of such an attitude in her numerous letters and instructions to headmistresses. The thought <…> of beneficial effects of a knowledge-fed mind never came to her, and the direction that she gave to female education took firm roots across the institutes for a long time." [Likhacheva 1899:234 (P. 2)]

Third, the organization of institutes became unified; "while the governorate institutes were mainly organized by the example of Moscow and Petersburg, although having no unity in their standards either and going by individual rules of various recency, the establishment of numerous new Institutes unveiled the need for introducing a stable unified order across all institutions of female education."[2]

Fourth, women's institutes became not just the focus of governmental attention but part of national education policy, which sought to satisfy the demand for education not only among hereditary and personal nobility but also among the Third Estate (guild, citizens of honor and burghers), low-income families and children left without parental care for whatever reason.

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[1] Board of Trustees' Publishing House (1854) *Obozrenie uchrezhdeniy imperatritsy Marii v 25-letie, s 1828 po 1853 g.* [Review of the Institutions of Empress Maria in 25 Years, Between 1828 and 1853], St. Petersburg: Board of Trustees' Publishing House, p. 234.

[2] Ibid.: 24–25.

Fifth, by the 1870s, women's institutes had gradually thrown off, as a result of reforms, the shackles of severe social class and privacy requirements inhibiting their development. The field became friendlier to teaching innovation; more focus came to be applied to the educational process; and an acute need for professional development of students was discovered. A number of new initiatives were pioneered by provincial institutes, such as the integration of advanced teaching ideas, active involvement of private charitable foundations, expansion of social composition of students, improvement of financial standing by increasing the number of visiting and self-funded students, etc.

Historiography of women's institute education of the first half of the 19th–early 20th century in Russia is represented by a number of sources. Below, the ones that served the basis for the subject of this study will be overviewed.

The first and foremost source to mention is Elena Likhacheva's four-volume oeuvre [1899] embracing the genesis and evolution of women's institute education in Russia, beginning from the 1760s and up until the cusp of the 20th century. Analyzing female education as a cultural phenomenon, Likhacheva traces changes in the public demand for women's education: "in the judgments of contemporaries to different eras of history of female education, the formula 'well-mannered' of Peter the Great's age—or 'nice, graceful and joyous', sometimes accompanied by 'educated', of Catherine the Great's times—came to include increasingly more often 'highly educated' at the end of the first third of our century." [Likhacheva 1899:301 (P. 2)]. Likhacheva's work is especially valuable for providing data on the organization of women's institutes in remote provinces of the Russian Empire, where demand for female education was rather high.

Information on the arrangement, management and regulation of various activities of women's institutes is contained in diverse normative factual documents: Collected Legislations of the Office of the Institutions of Empress Maria, Statute of Institutions of Women's Education, Review of the Office of the Institutions of Empress Maria, and others. An essential database for source study is provided in the work of Ivan Seleznev published to mark the 50th Anniversary of the Office of the Institutions of Empress Maria, which encompasses unique materials and authentic documents capturing the educational processes of all institutions of female education that were under imperial patronage in 1828–1878.[3]

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[3] Seleznev I. (ed) (1878) *Pyatidesyatiletie IV otdeleniya Sobstvennoy Yego Imperatorskogo Velichestva kantselyarii: [1828–1878]: khronika Vedomstva uchrezhdeniy Imperatritsy Marii, sostoyashchikh pod neposredstvennym Ikh Imperatorskikh Velichestv pokrovitel'stvom* [50th Anniversary of the Fourth Section of His Imperial Majesty's Own Chancellery: [1828–1878]: A Timeline of the Office of the Institutions of Empress Maria under Immediate Patronage of Their Imperial Majesties], St. Petersburg: V. Demakov's Publishing House.

Some axiological aspects of female education in pre-revolutionary Russia attract the research interest of a number of modern authors. Eduard Dneprov and Raisa Usacheva analyze how the organization and content of female secondary education transformed in the context of national reforms, turning it into an independent "education industry", within the framework of which the model of institute education changed as well. With all the shortcomings, isolation from the general education system and criticism from the 19th-century elite, the authors point out, women's institutes played a groundbreaking role at some point of development: "For almost fifty years, the new century would preserve the model of closed women's institute designed by Ivan Betskoy and Catherine the Great as the only type of institution of female secondary education <...>—not only preserve but also spread it over many governorates of Russia, having made its essential amendments." [Dneprov, Usacheva 2009:35]

A unique retrospective analysis of different aspects of female education organization is provided in the cycle of works by Varvara Ponomareva and Lyubov Voroshilova [2017]. Unfortunately, the history of Emperor Nicholas I Orenburg Women's Institute still remains outside the focus of attention of the local research community, with the exception of some fragmentary publications.

This article aims at reconstructing the history of development of female secondary education in Emperor Nicholas I Orenburg Women's Institute in the second half of the 19th–early 20th century.

From Maidens' School to Emperor Nicholas I Orenburg Women's Institute

In the first third of the 19th century, Orenburg Governorate was a remote militarized cross-border outskirt of the Russian Empire, a territory of ethnic and religious heterogeneity partly inhabited by political exiles. Men's education had been institutionalized by the 1830s, while the issues of women's education remained unsolved, despite the large size of the governorate.

An especially meritorious contribution in the foundation and organization of the first women's (maidens') school in Orenburg Governorate was that of the military governor Paul Graaf van Suchtelen (governed in 1830–1833), who considered it timely to establish one and submitted a relevant claim to the emperor. Substantiating the need for creating such schools, Maria Feodorovna would say that "the sovereign himself takes care of the fate of soldiers' sons, but the destiny of daughters is yet unattended." [Likhacheva 1899:46 (P. 2)] Therefore, schools for daughters of Semyonovsky, Jaeger and Moscow Guard Regiment officers were opened in Peterburg in 1820, and schools for daughters of lower-rank Black Sea Fleet officers were founded in Sevastopol and Nikolayev in 1826. At the request of the Governor General of Orenburg, the project referred to as Resolution on a Special Department for Raising Female Children at Neplyuev Military School was approved and sanctioned by Emperor Nicholas I.

December 6, 1832 is the official date of establishment of the "department for raising maidens", which was named Orenburg Maidens' School and classified as Category 3 educational institution "for daughters of lower-rank officers and poor parents of all ranks."[4] At the opening ceremony, governor van Suchtelen underlined the significance of having a maidens' school in a remote province such as Orenburg Governorate: "Citizens of Orenburg, write down the present date and the present happening in the annals of your homeland <...> On this day, the foundation is laid for the education of your cherished children."[5]

At the early stage, the statute of the school was elaborated in accordance with the regulations of Petersburg schools for daughters of guard regiment officers and maidens' schools for daughters of lower-rank Black Sea Fleet officers "with modifications specific to the governorate."[6] According to the statute, Orenburg Maidens' School was established for children of all estates and "all free classes", "whose fathers served or currently serve as lower-rank officers of the Special Orenburg Corps." Additionally, it was "acceptable to admit children from unorthodox families at the request of their parents or in case of orphancy."[7] Development and management of the female education "department" was assigned to a committee consisting of the director of Neplyuev Military School, reputable ladies and spouses of generals doing military service in Orenburg.

The maidens' school enrolled 50 girls aged 7 to 12. Students would come to the school only to attend classes (boarding was not provided for). The term of education was not specified—girls would take exams every year and graduate upon completing all the courses. The list of enrollees attached to van Suchtelen's letter to St. Petersburg offers insight into the social composition of the first intake: "33 out of 50 vacancies were filled by maidens of 'military ranks', from retired colonel to orderly; the rest 17 came from families of "all free classes"—public servants, burghers, a merchant of the 3rd guild, a dyak, and an emancipated serf."[8]

Category 3 educational institutions were supposed to teach only "the subjects necessary for poor children, and all classes should have a paramount focus on handicraft as the main professional purpose of students in the future." [Likhacheva 1899:43 (P. 3)]. Girls were taught a basic set of disciplines, which included religious instruction, reading, writing, Arithmetic Basics: Textbooks and Abacus, manufacturing of clothes, gloves and shoes, embroidery, and other "useful handicrafts."

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[4] State Archive of Orenburg Oblast (hereinafter "SAOO"). Stock no 6, inv. no 5, doc. no 10601/10, p. 1.

[5] Vertousova E. (2006) Otvedi Bog bol'she vremeni... [May God Grant Us More Time...]. *Gostiny dvor*, no 20, p. 283.

[6] Russian State Historical Archive (hereinafter "RSHA"). Stock no 759, inv. no 4, doc. no 1615, p. 15.

[7] RSHA. Fund no 759, inv. no 8, doc. no 5, p. 196.

[8] RSHA. Fund no 759, inv. no 8, doc. no 35, pp. 9–10 rev.

The curriculum was getting more complicated throughout the 1840s as new disciplines were introduced. The library holdings were replenished with the magazines *Detsky Almanakh* (Children's Almanach), *Zvezdochka* (Little Star), books *A Journey Around the Globe*, *Collected Works for Children*, *Prokopiy Lyapunov*, textbooks and teaching guides[9].

In 1845, with the active participation of the Orenburg military governor Vladimir Obruchev (governed in 1842–1851), the maidens' school became class-selective. As the Governor General noted, "maidens of the lower class usually did not make use of the knowledge acquired and turned to menial labor or trade, whereas maidens of the middle class found the curriculum too elementary. Therefore, the number of those willing to send their daughters to the school decreased among the lower classes and increased among public servants because there were no other educational institutions for girls in the region."[10]

In 1847, at the request of Obruchev, the maidens' school was reorganized and received a "new structure", and "the living and learning standards were brought into compliance with the general rules of other institutions for noble maidens." [11] The educational institution for daughters of field and company officers of the troops in the Orenburg Defense Line and the Cossack troops, as well as civil officials doing military service in the region, priests and merchants of the 1st guild was intended to "consolidate and spread women's education in the region." [Likhacheva 1899:33 (P. 3)]

At the end of 1849, Olympias Jacquesmond became the headmistress of Orenburg Maidens' Institute. It follows from the memoirs of her son that the institute was in a deplorable state at that time: "The students, up to forty in number, were nearly all rude, ill-mannered Cossacks, pronouncing the unstressed 'o' as 'o' and often using obscene language in conversation. The institute's economy was based on a trifling practice of saving firewood and soap <...> Organization of educational affairs was also unsatisfactory. Teachers with no civilian rank <...> were heavy-drinking and illiterate people who missed a lot of classes during the school year."[12]

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[9] Printing and Lithography House of the Governorate Administration (1909) Sistematicheskaya opis' del arkhiva Orenburgskoy uchenoy arkhivnoy komissii. Trudy Orenburgskoy uchenoy arkhivnoy komissii [Systematic Inventory of the Archives of Orenburg Scientific Archive Commission. Proceedings of Orenburg Scientific Archive Commission], Iss. 20, Orenburg: Printing and Lithography House of the Governorate Administration, p. 28.

[10] SAOO. Fund no 6, inv. no 10, doc. no 362, p. 206.

[11] Board of Trustees' Publishing House (1854) *Obozrenie uchrezhdeniy imperatritsy Marii v 25-letie, s 1828 po 1853 g.* [Review of the Institutions of Empress Maria in 25 Years, Between 1828 and 1853], St. Petersburg: Board of Trustees' Publishing House, pp. 63–64.

[12] Jacquemond P. (1905) Iz vospominaniy orenburgskogo starozhila [From the Memories of an Old Orenburg Resident]. *Istoricheskiy Vestnik / The Histor-*

The new headmistress was to change completely the educational and economic life of the institute. In 1850, a temporary preparatory class was established at the institute with 30 vacancies for young daughters of field and company officers of the Ural and Orenburg Cossack Hosts. Through the efforts of Jacquesmond, the institute improved its teaching, methodological, material and financial resources and kept increasing the number of students, most of whom belonged to nobility and, to a lesser extent, the merchant class. Geography of student enrollment expanded significantly, covering not only Orenburg Governorate but also Samara and Ufa Governorates, Turkestan, Turgay and Ural Oblasts.

At Jacquesmond's personal request to Empress Alexandra Feodorovna, Orenburg Maidens' Institute was renamed into Orenburg Nicholas I Institute of Maidens' Education and assigned Category 2 of institutions of female education by royal decree on October 13, 1855. The main goal of the reorganized women's institute was "to provide education to children of civil servants in remote steppe regions." [Likhacheva 1899:32–33 (P. 3)].

In 1880, the institute lost its status of a closed-type educational institution—in addition to 150 full boarders, it began to enroll day boarders and visiting students[13]. Furthermore, the three-course program with two-year courses in every subject was replaced with a seven-course program with one-year courses.

Since the 100th anniversary of Nicholas I in 1896, the institute has been known as Emperor Nicholas I Orenburg Women's Institute.

By the end of the 19th century, the institute had developed a solid infrastructure. Its premises and holdings were estimated at several million rubles and were of great value; its buildings and facilities had all necessary amenities, including electricity, running water, a bathing room, a laundry room, an ironing room, a dining room, an infirmary, classrooms equipped with visual aids, an extensive library, rent-free apartments for the headmistress and other staff, and a house church. The institute disposed of 10.8 acres of land in Troitsk Uyezd and 16 buildings.[14]

Emperor Nicholas I Orenburg Women's Institute: General and Educational Organization

The organization and specifics of the educational process at Emperor Nicholas I Orenburg Women's Institute are most fully reflected in its admission documents and materials, student progress reports, students' credentials and certificates of graduation, and minutes of meetings of the pedagogical council.

The following documents had to be submitted for admission: "1) copy of father's military service records (official list or certificate), if

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icalReporter, Vol. 100, April–June, p. 76.
[13] SAOO. Fund no 11, inv. no 9, doc. no 21.
[14] RSHA. Fund no 759, inv. no 32, doc. no 979.

any, as well as other legal acts indicating belonging to estates that entitle maidens to apply to institutions of specific categories; 2) religious certificates of legal birth and baptism; 3) medical certificate of health and certificate of smallpox eradication or vaccination."[15]

Minimal skills and abilities were required from applicants for vacancies at the institute: knowledge of prayers, ability to read, write and count, and speaking at least one foreign language[16].

The institute also accepted students transferred from institutions of female education in other cities, such as Petersburg (Petersburg Patriotic Institute), Moscow (Moscow Orphan Institute)[17], Samara and Odessa[18].

Emperor Nicholas I Orenburg Women's Institute was assigned Category 2 (1855) with less than 100 students enrolled, but this number was exceeded under various circumstances. Orenburg Maidens' School barely had 40 students in 1832. In 1855–1856, there were 80 girls including fresh enrollees. On December 17, 1866, standard enrollment requirements for closed institutions of female education under the Office of the Institutions of Empress Maria was imperially established, in compliance with which the institute's maximum enrollment was set at 75 (while in reality it had 83 students)[19]. "There were 75 girls enrolled, of whom 20 were self-funded and the others were full boarders,"[20] in 1868, 167 in 1890[21], 202 in 1913, 209 in 1916, and 222 in 1917. In 1918, the women's institute took care of 200 orphaned and half-orphaned girls and had around 50 visiting students[22].

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[15] K. Shtremer's Printing and Lithography House (1884) *Ustav zhenskikh uchebnykh zavedeniy Vedomstva uchrezhdeniy imperatritsy Marii, vysochayshe utverzhdenny 30 avgusta 1855 g. S posleduyushchimi dop., izm., tsirkulyar. rasporyazheniyami i predpisaniyami po 1 yanv. 1884 g.* [Charter of Institutions of Women's Education under the Office of the Institutions of Empress Maria, Imperially Approved on August 30, 1855, with Subsequent Additions, Amendments, Circular Orders and Instructions up to January 1, 1884], St. Petersburg: K. Shtremer's Printing and Lithography House, § 66, p. 23].

[16] Orenburg Governorate Publishing House (1868) *Spravochnaya knizhka Orenburgskoy gubernii na 1868 g. Pravila priema devits v Orenburgskiy Nikolaevskiy institute* [Reference Book of Orenburg Governorate for 1868: Rules for Admitting Maidens to Emperor Nicholas I Orenburg Institute], Orenburg: Orenburg Governorate Publishing House, § 8, p. 19].

[17] SAOO. Fund no 87, inv. no 1, doc. no 21, p. 3.

[18] SAOO. Fund no 87, inv. no 1, doc. no 21, p. 15.

[19] *Orenburgsky Listok*, June 9, 1885, no 25, p. 3.

[20] Orenburg Governorate Publishing House (1868) *Spravochnaya knizhka Orenburgskoy gubernii na 1868 g. Pravila priema devits v Orenburgskiy Nikolaevskiy institute* [Reference Book of Orenburg Governorate for 1868: Rules for Admitting Maidens to Emperor Nicholas I Orenburg Institute], Orenburg: Orenburg Governorate Publishing House, § 2, p. 18.

[21] Orenburg Governorate Publishing House (1892) *Statisticheskiy ocherk Orenburgskoy gubernii* [A Statistical Review of Orenburg Governorate], Orenburg: Orenburg Governorate Publishing House, p. 17.

[22] SAOO. Fund no 87, inv. no 1, doc. no 24, p. 40.

Emperor Nicholas I Orenburg Women's Institute was under the jurisdiction of the Office of the Institutions of Empress Maria, whose fundamental principle was, "Poverty gives priority right for full boarding at the expense of the crown". That is to say, such institutions raised and educated not only self-funded girls but also state-funded students—daughters of military men, disabled veterans and officers' widows, as well as orphans.

Children of hereditary nobles had the preferential right to study at the institute at public expense, but there was a competition for tuition-free places. Applicants did not take exams but were selected randomly. In 1916, for example, "an orphan vacancy was filled by the 6th-grade student Anna Yepaneshnikova, and one state-funded half-orphan vacancy fell to the lucky lot of the maiden Maria Loshkareva."[23]

Archival documents indicate that the institute's finances for education of "deficient" students were not restricted to state allocations but also included a variety of ministry scholarships and interest on charitable funds donated and bequeathed to the institute by individuals or organizations. In February 1904, for example, the Natalia Khondzynskaya Scholarship was established with the capital that Khondzynskaya donated to the institute[24]. A special category of students were eligible for scholarships of the Ministry of War and military committees as well as funding from the host and order[25] capitals. For instance, Tatyana Isaenko, daughter of a lieutenant *yesaul* of the Orenburg Cossack Host, had her education funded by donation capital[26]; Raisa Lysova, daughter of a retired *sotnik*, was awarded the Alexeev Military Committee Scholarship; Iraida Grigorovich was admitted in 1916 under His Majesty the Emperor Scholarship[27]; "students E. Belinskaya, E. Belyaeva and A. Yemelyanova were sponsored by the Governor General of Turkestan, and V. Timofeeva was granted the Widow Jonas Scholarship."[28]

On December 2, 1882, the Military Council's imperially approved Regulations On Withdrawal of Scholarships for Daughters of the Ural Host at Nicholas I Institute resolved the following: "1) scholarships allo-

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[23] SAOO. Fund no 87, inv. no 1, doc. no 15.

[24] State Publishing House (1913) *Sobranie uzakoneniy Vedomstva uchrezhdeniy imperatritsy Marii. T. V. Tsarstvovanie gosudarya imperatora Nikolaya Vtorogo. Kn. 4. №№ 2018–2646. S1 yanv. 1904 g. po 30 dek. 1906 g.* [Collected Legislations of the Office of the Institutions of Empress Maria. Vol. V: The Reign of His Majesty Emperor Nicholas II, Book 4, nos 2018–2646, January 1, 1904–December 30, 1906], St. Petersburg: State Publishing House, p. 60.

[25] Holders of Russian imperial and royal awards (orders) were required to make contributions to form an order capital to be spent on charitable affairs and education of "deficient" chevaliers' daughters in women's institutes.

[26] SAOO. Fund no 87, inv. no 1, doc. no 15.

[27] SAOO. Fund no 87, inv. no 1, doc. no 19.

[28] RSHA. Fund no 759, inv. no 56, doc. no 218, pp. 21–23.

cated for the Ural Cossack Host at Nicholas I Institute shall be gradually withdrawn as the current scholarship holders complete their courses; 2) the amount withheld from the funds currently allocated for the maintenance of daughters of military fathers in the named institute as well as the entire amount as the scholarships have been withdrawn completely shall be used to reinforce the special funds of Ural Gymnasium for Military Daughters."[29] As Ponomareva notes, "by its type, Orenburg Women's Institute was a peripheral educational institution, just like the institutes of the Don and Kuban Cossack Hosts located in areas remote from the center, populated by poor and low-educated people. However, the Don and Kuban institutes were partially sponsored by the Cossacks and were governed with the participation of the Cossack elite. The Cossacks of Southern Russia were settled on fertile lands and paid a land tax to support their own women's institutes, whereas the Ural Cossacks had no such favorable conditions and could not afford such expenses." [Ponomareva 2018:351] Still, funding continued to be procured, and 19 vacancies were opened at the institute for daughters of the Orenburg Cossack Host in 1891 [Starikov 1891: 59]. In 1893, the institute had no students from among the military Cossack class funded at the expense of the crown; ten girls were sponsored by the host capital, and ten more, by their parents and public funds[30]. In 1918, the lieutenant colonel of the Orenburg Cossack Host decided to allocate 75 scholarships of 1,000 rubles yearly to daughters of Cossacks[31].

During World War I, "up to 70% of students were daughters of officers and Cossacks fighting at the Austrian-German front who were exempted from tuition and maintenance fees or were granted various scholarships for the period of war. Ten students were fully state-funded, 21 had scholarships from the Ministry of War, 11 were sponsored by the Orenburg Cossack Host, one by the headquarters of Turkestan Military District, four by the Governor General of Turkestan, six by Emperor Alexander I Committee and Alexeev Committee, seven by the Special Border Guard Corps, and 15 by other organizations and individuals[32]. There was a significant increase in the number of parents applying for tuition fee deferral during that period, as the financial situation of many families worsened radically. Starting with the end of 1914, the institute's admission documents feature more and more ap-

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[29] State Publishing House (1895–1916) *Sobranie uzakoneniy Vedomstva uchrezhdeniy imperatritsy Marii. T. IV. Tsarstvovanie gosudarya imperatora Aleksandra Tretyego. Kn. 1. S1 marta 1881 g. po 31 dek. 1885 g.* [Collected Legislations of the Office of the Institutions of Empress Maria. Vol. IV: The Reign of His Majesty Emperor Alexander III, Book 1, March 1, 1881–December 31, 1885], St. Petersburg: State Publishing House, no 219, pp. 249–250.

[30] *Orenburgskie Gubernskie Vedomosti*, July 7, 1895, no 12, pp. 5–6.

[31] Report of the Military Government of the Orenburg Cossack Host to the Emergency Cossack Assembly dated September 19, 1918 [no place, 1918], p. 47.

[32] SAOO. Fund no 87. Dep. 1, doc. no 24, p. 41.

plications from officers of the army's combat forces and World War I veterans or their widows asking to enroll their daughters in vacancies funded by the crown.

A relatively small percentage of students had their studies funded by parents or benefactors. The size of boarding fee depended on the category and location of the educational institution[33]. For instance, the 1868 Rules of Admission to Emperor Nicholas I Orenburg Women's Institute set the following tuition fee rates: "130 rubles per year for boarders funded by institutional grants and His/Her Imperial Majesty Scholarships; and 90 rubles per year for maidens sponsored by individuals. In addition, 30 rubles shall be charged from every newly-admitted boarder to cover the initial acquisition of clothing and equipment."[34] By 1877, the tuition fee had increased to 150 rubles, and in June 1885, the institute's council brought to general notice that "on the 30th day of May this year, His Majesty the Emperor decided, by royal decree, to raise the yearly boarding fee at this institute from 150 to 250 rubles for each newly admitted boarder starting from the upcoming academic year 1886."[35] By the outbreak of World War I, the cost of a year of study was 180 rubles for 6th-graders and 460 rubles for 7th-graders."[36]

For all women's institutes, in accordance with their category, the Charter of the Office of the Institutions of Empress Maria introduced uniform "special schedules for sciences, languages and arts taught," which included The Law of God, Russian, Pedagogy, Geography, History, French, German, Physics, Natural Science, Cosmography, Mathematics, Arithmetic, Hygiene, Drawing, Calligraphy, and Singing. Points were also awarded for behavior and neatness."[37]

It was prescribed to complement the curriculum with "reading of edifying books." [38] To foster the development of mental abilities, liter-

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[33] K. Shtremer's Printing and Lithography House (1884) *Ustav zhenskikh uchebnykh zavedeniy Vedomstva uchrezhdeniy imperatritsy Marii, vysochayshe utverzhdenny 30 avgusta 1855 g. S posleduyushchimi dop., izm., tsirkulyar. rasporyazheniyami i predpisaniyami po 1 yanv. 1884 g.* [Charter of Institutions of Women's Education under the Office of the Institutions of Empress Maria, Imperially Approved on August 30, 1855, with Subsequent Additions, Amendments, Circular Orders and Instructions up to January 1, 1884], St. Petersburg: K. Shtremer's Printing and Lithography House, Supplements to § 42, p. 108].

[34] Orenburg Governorate Publishing House (1868) *Spravochnaya knizhka Orenburgskoy gubernii na 1868 g. Pravila priema devits v Orenburgskiy Nikolaevskiy institute* [Reference Book of Orenburg Governorate for 1868: Rules for Admitting Maidens to Emperor Nicholas I Orenburg Institute], Orenburg: Orenburg Governorate Publishing House, § 2, p. 18.

[35] *Orenburgsky Listok*. June 1, 1885, no 24, p. 3.

[36] SAOO. Fund no 87, inv. no 1, doc. no 1.

[37] SAOO. Fund no 87, inv. no 1, doc. no 9, p. 3.

[38] K. Shtremer's Printing and Lithography House (1884) *Ustav zhenskikh uchebnykh zavedeniy Vedomstva uchrezhdeniy imperatritsy Marii, vysochayshe*

ary taste and interest in reading among students, the institute provided a library "with a judicious selection of books," subdivided into the student library (2,698 books and 3,522 volumes) and the fundamental library (976 books and 3,942 volumes). To replenish its holdings on a regular basis, the library had subscriptions for such magazines as *Zhenskoe Obrazovanie* (Women's Education), *Semya i Shkola* (Family and School), *Niva*, *Russkaya Muzykalnaya Gazeta* (Russian Musical Newspaper) and *Nauchnoe Obozrenie* (Scientific Review) as well as periodicals in Russian, French and German[39].

Even though Nicholas I Orenburg Women's Institute was a provincial educational institution, it could compete with the most famous institutions of Moscow and Petersburg in terms of equipment with visual aids, maps, models, mechanisms and devices in every discipline. The institute's solid teaching and methodology base is reflected in a multi-page archival inventory of available teaching guides, scale models, maps and atlases. There were 40 to 60 units of various devices and instruments for a variety of topics in Physics, Chemistry, Natural Science and Cosmology, including a centrifugal machine, an apparatus to explain oblateness of the Earth, a Quincke device for demonstrating pendulum oscillation, a dynamometer, a Baume hydrometer, a magic lantern, a carbide lamp, an image projector, a model of a steam engine, a Kolbe's electroscope, a model of a telegraph key, a tellurion, a raised relief world globe, a collection of minerals, cosmographic charts, etc.[40] The first impressions of classroom equipment at the institute are captured in the memoirs of its student Anna Borodina: "I remember the first day of my stay [at the institute.—*Author's note*] <...> I was taken up a wide marble staircase covered with a carpet to the second floor and into a classroom. There were icons hanging in the corner, beautiful kerosene lamps under the ceiling, tall book cabinets with educational supplies and aids along the walls, various physics and geography instruments on the tables, and stuffed birds of all kinds on the tall cabinets <...> As I found out later, that was the classroom of Physics and Biology, and that was also where I saw a world globe for the first time. Equipment of regular classrooms was much more modest."[41]

The first subject on the curriculum was The Law of God and Catechism. Alexandra Tsaritsyntseva, a graduate of the institute and

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utverzhdenny 30 avgusta 1855 g. S posleduyushchimi dop., izm., tsirkulyar. rasporyazheniyami i predpisaniyami po 1 yanv. 1884 g. [Charter of Institutions of Women's Education under the Office of the Institutions of Empress Maria, Imperially Approved on August 30, 1855, with Subsequent Additions, Amendments, Circular Orders and Instructions up to January 1, 1884], St. Petersburg: K. Shtremer's Printing and Lithography House, Chapter V, § 105, p. 31].

[39] SAOO. Fund no 87, inv. no 1, doc. no 9, p. 3.

[40] SAOO. Fund no 87, inv. no 1, doc. no 18, pp. 61–93.

[41] Bobrova E. (2015) "Sred' shumnogo bala..." [Amidst the Noisy Ball...]. *Gostiny Dvor*, June 21. Available at: http://orenlit.ru

daughter of Pavel Korelin, colonel of the Orenburg Cossack Host, notes: "The juniors studied The Law of God—prayers and their meaning, church holidays, some parables from the Gospel; the seniors studied church service from A to Z, its meaning and significance. We were taught by Father Dmitry Kononov, a protoiereus, who also served in our house church. Every day began with morning prayers and ended with evening prayers. We especially loved singing in the institute's church choir. Church singing was taught by the priest John Solomin, who had a court chapel certificate."[42]

Curricula were designed to allow for the heterogeneous religious composition of the students, as there were Orthodox as well as Catholic, Lutheran and Mohammedan (Muslim) girls. "Beginning from the 20th century, daughters of Old Believers were admitted to the institute as well." [Ponomareva 2018:351] In addition to an Orthodox priest, there were also a Roman Catholic priest and a Lutheran pastor to teach The Law of God. Maidens of "other faiths" were "not to be forced to attend classes where the Christian Law of God was taught,"[43]; "any forceful attempts to convert Mohammedan girls to Christianity should be avoided."[44]

The institute paid much attention to teaching the Russian language. In the introductory note to the Russian course, the Charter of Women's Educational Institutions postulates: "The task of the teacher of the Russian language <…> is not only to convey the content of what has been read but also to explain the structure and to point to logical connections among different parts of the whole piece <…> to give her moral and aesthetic evaluations, to develop students' ability to express their thoughts verbally and on paper correctly—not only in terms of grammar but also in terms of logic," "to cultivate <…> a passion for studying the historical development of the language and getting to know the most outstanding literary oeuvres."[45]

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[42] Semenov V. (1997) Eshche raz ob Orenburgskom institute blagorodnykh devits [Revisiting the Case of Orenburg Institute for Noble Maidens]. *Gostiny Dvor*, no 5, p. 230.

[43] RSHA. Fund no 759, inv. no 8, doc. no 35, p. 199.

[44] Seleznev I. (ed) (1878) *Pyatidesyatiletie IV otdeleniya Sobstvennoy Yego Imperatorskogo Velichestva kantselyarii: [1828–1878]: khronika Vedomstva uchrezhdeniy Imperatritsy Marii, sostoyashchikh pod neposredstvennym Ikh Imperatorskikh Velichestv pokrovitel'stvom* [50th Anniversary of the Fourth Section of His Imperial Majesty's Own Chancellery: [1828–1878]: A Timeline of the Office of the Institutions of Empress Maria under Immediate Patronage of Their Imperial Majesties], St. Petersburg: V. Demakov's Publishing House, p. 396.

[45] K. Shtremer's Printing and Lithography House (1884) *Ustav zhenskikh uchebnykh zavedeniy Vedomstva uchrezhdeniy imperatritsy Marii, vysochayshe utverzhdenny 30 avgusta 1855 g. S posleduyushchimi dop., izm., tsirkulyar. rasporyazheniyami i predpisaniyami po 1 yanv. 1884 g.* [Charter of Institutions of Women's Education under the Office of the Institutions of Empress Maria, Imperially Approved on August 30, 1855, with Subsequent Additions, Amend-

Tsaritsyntseva's memoirs give quite a comprehensive picture of the institute's methods of teaching Russian: "In the junior grades, Russian was taught using the grammar textbook and chrestomathies; senior students read and analyzed classics and got acquainted with literary critics along the way, such as Pisarev, Dobrolyubov, and others. We would write essays and abstracts, sometimes as part of other courses; along with abstracts, we would do reports on the topic and always debate with opponents (students argued about the literary material read and learned). In the junior grades, we would write synopses, prosify poems, take dictations; in the senior ones, we would write compositions, the best ones to be read aloud to everyone. Mistakes—grammatical, stylistic and others—would be analyzed. Fiction—French, German, Russian—would be borrowed from the institute library."[46]

The institute library had a fundamental and sophisticated selection of methodology guidelines on teaching the Russian language and literature, written by famous etymologists, linguists, professors and academicians of philology departments of Russian universities as well as the best practitioners specialized in Russian literature. To ensure effective teaching in language and literature, the institute disposed of oeuvres created by such masters of Russian philology and etymology as Jonah Vertogradsky, Vyacheslav Voskresensky, Alexey Galakhov, Yakov Groth, Vasily Pokrovsky, Alexander Preobrazhensky, etc.[47]

Nicholas I Orenburg Women's Institute attached particular importance to the development of oral and written communication skills in "new" (European) languages. The most important method of teaching foreign languages involved regular speaking practice based on language immersion: students were requested to alternate German and French every other day in conversations with teachers and governesses, while speaking Russian was not allowed. The Office of the Institutions of Empress Maria even pursued a more challenging goal in teaching European languages, namely to promote comparative studies between foreign languages and Russian. "To achieve this goal, our teachers of foreign languages should master the grammar teaching techniques used by the best teachers of Russian, that is, to describe the etymological and syntactic features of the languages that they teach."[48]

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ments, Circular Orders and Instructions up to January 1, 1884], St. Petersburg: K. Shtremer's Printing and Lithography House, Supplement to § § 106, 108, pp. 225, 253].

[46] Semenov V. (1997) Esche raz ob Orenburgskom institute blagorodnykh devits [Revisiting the Case of Orenburg Institute for Noble Maidens]. *Gostiny Dvor*, no 5, p. 230.

[47] SAOO. Fund no 87, inv. no 1, doc. no 18, p. 88–89.

[48] K. Shtremer's Printing and Lithography House (1884) *Ustav zhenskikh uchebnykh zavedeniy Vedomstva uchrezhdeniy imperatritsy Marii, vysochayshe utverzhdenny 30 avgusta 1855 g. S posleduyushchimi dop., izm., tsirkulyar.*

Graduates of the institute spoke and wrote excellent French thanks to the high level of teacher professional training. It was considered normal and even necessary for women's institutes to recruit teachers, class mistresses and governesses from abroad. For example, it follows obviously from the personal record (1909) of the teacher Johanna Paten that the institute hired a French woman to teach French—that is, a native speaker of the target language.[49] The teacher E. Gartier also had a brilliant education—she had completed a full course of sciences at Emperor Nicholas I Petrograd Orphan Women's Institute and had diplomas of the Universities of Paris and Grenoble.[50]

Teachers of women's educational institutions had to meet rather stringent requirements, which especially concerned professional skills of subject teachers and governesses. Assessment criteria included deep knowledge of the subject, pedagogical excellence, tact, responsibility, and an exacting attitude to students. Personal and service records of some teachers preserved in the State Archive of Orenburg Oblast indicate that many of them obtained education in the leading Russian universities and pedagogical educational institutions of Petersburg, Moscow, Kiev, Riga, Pernau (Governorate of Livonia), Kharkov, Samara, Kazan and other major cities. For instance, it follows from A. Ginalskaya's credentials that she was awarded a first-class free artist honors degree and was a member of the All-Russia Teachers Union.[51]

Propagation of political opinions was radically suppressed at the institute—not only teachers but also Orthodox and Catholic priests were tested for loyalty by the administrators.[52]

A general idea of educational organization at Emperor Nicholas I Orenburg Women's Institute is provided by the surviving academic reports, internal notes and administrative registers. For example, the 1916/17 mid-year report compiled by V. Kazansky, collegiate councillor and chairman of the pedagogical council, contains a detailed analysis of the educational process. In particular, the document says: "Teaching in the first half of the 1916/17 academic year complied with the schedule adopted by the Education Conference in its meeting on August 20, 1916 as well as the curricula approved on July 16, 1911. Out of the total of 209 students, three demonstrate excellent, 67 very good, 36 good, 21 satisfactory, and 72 unsatisfactory performance; the re-

rasporyazheniyami i predpisaniyami po 1 yanv. 1884 g. [Charter of Institutions of Women's Education under the Office of the Institutions of Empress Maria, Imperially Approved on August 30, 1855, with Subsequent Additions, Amendments, Circular Orders and Instructions up to January 1, 1884], St. Petersburg: K. Shtremer's Printing and Lithography House, Supplement to § 106, p. 229.

[49] SAOO. Fund no 87, inv. no 1, doc. no 3.
[50] SAOO. Fund no 87, inv. no 1, doc. no 16.
[51] SAOO. Fund no 87, inv. no 1, doc. no 20.
[52] SAOO. Fund no 87, inv. no 1, doc. nos 16–17.

maining ten have not been evaluated. The overall performance rate of the institute in the first half of the 1916/17 academic year was 75.4%. Classes began on August 23 and ended on December 17, which makes 85 school days in total. Scores obtained by every student during the first semester are recorded in the designated Score Book. The non-attendance rate was 6.4%."[53] Up until 1917, academic success of students was assessed on a 12-point scale, where 12 = "excellent"; 11 = "A–"; 9–10 = "good"; 7–8 = "satisfactory"; 6 = "mediocre"; 5 = "unsatisfactory"; and 1–4 = "very weak". Scores below 7 suggested grade retention. In 1917, institutions of women's education switched to a 5-point student performance assessment scale.

World War I with its inevitable hardships, reduced food rations, sharp deterioration in the financial standing of households and losses of breadwinners had naturally negative effects on students' performance. Therefore, in 1915–1917, the administration of Emperor Nicholas I Women's Institute provided assistance to low-performing girls who could not complete the program because of being overage, orphaned, slow in development or insufficiently prepared or missing classes due to illness. The measures taken by the management were undoubtedly successful: for example, "in 1916, 57 students were taken under supervision, of which 20 improved their results in three months; in the second trimester of the 1916/17 academic year, 20 out of 46 students improved; in the third trimester of 1917, 45 out of 57 improved."[54]

Socialization of Students of Emperor Nicholas I Orenburg Women's Institute: Class Organization

During the period analyzed—the second half of the 19th–early 20th century—the future of women's institute graduates was quite a concern due to a number of circumstances. In particular, Russian nobility was rapidly growing poorer and more "economically depleted" as a class, and noble parents increasingly often found themselves unable to leave a decent inheritance to their daughters. The middle class and provincial households also belonged to low-income strata, and a series of epidemics and wars inevitably entailed orphanage and poverty. The institute's management and the board of trustees sought to secure a self-sustained life for their students, first of all girls from poor families, orphans and daughters of disabled war heroes who had sacrificed their lives and health for the homeland.

In pre-revolutionary Russia, teaching was regarded as the most respectable occupation for self-sufficient women. "For the majority of female students, education is the only capital that can save them from poverty in the future in case a comfortable married life does not come their way; in most cases, they use this capital for teaching as governesses or home teachers," wrote Vladimir Stoyunin, a prominent Rus-

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[53] SAOO. Fund no 87, inv. no 1, doc. no 18, p. 24.
[54] SAOO. Fund no 87, inv. no 1, doc. no 18, pp. 48–49.

sian pedagogue and educational theorist [Stoyunin 1892:541]. The issue of necessity and importance of professional training for girls was raised repeatedly by the local community. In 1885, *Orenburgsky Listok* wrote: "Institutions of women's education in Orenburg (institutes, gymnasiums, progymnasiums, two-year parochial schools) are overcrowded with students, of whom more than half come the poorest families. Generally speaking, such an aspiration for women's education is highly gratifying. At the same time, however, it has an uncomfortable side to it. Due to the predominance of theoretic elements in education, our "learned" young women enter life with almost no practical training. Very often, they are doomed to poverty, ill-being and becoming a burden for their family, their only alternative being teaching work, which is, however, very limited and not accessible to everyone."[55]

As part of induction to the teaching profession, the institute's management allowed final-year students interested in education issues to help class mistresses with younger children and master the basics of pedagogy. When issuing certificates of 7th grade completion, the pedagogical council recommended the most distinguished graduates for receiving a certificate of "home teacher (tutor) in those subjects in which she showed a high level of performance as a student" [56] from the Ministry of National Education.

After completing the main program, some of the graduates would take another year of *classe pépinière* to stay at the institute as teachers. To promote the *classe pépinière* initiative, the institute's management worked hard to expand the existing training course. According to a ruling of the board of trustees of March 4, 1878, *classe pépinière* in women's institutes involved six classes per week. The institute's council filed a petition to the Office of the Institutions of Empress Maria asking to increase the number of teaching hours in *classe pépinière* from six to nine, "based on the fact that the majority of institute graduates should earn their livelihood by teaching, which requires training that is impossible to provide within the current one-year period of *classe pépinière*." On account of the above, the board of trustees decided "to ask His Imperial Majesty's royal permission to increase the number of classes from six to nine per week in the said *classe pépinière*, provided that 1) it does not require heavier expenditures from the Office and 2) such classes are distributed among no more than three or four subjects, the choice of which, as proposed by the institute's management, should be made by the Chief Administrator of His Imperial Majesty's Own Chancellery for the Institutions of Empress Maria." The relevant decree was approved by the emperor on October 16, 1892.[57]

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55 *Orenburgsky Listok*, March 3, 1885, no 10, p. 58.
56 SAOO. Fund no 87, inv. no 1, doc. no 9, p. 3.
57 State Publishing House (1913) Sobranie uzakoneniy Vedomstva uchrezhdeniy imperatritsy Marii. T. IV. Tsarstvovanie gosudarya imperatora Aleksandra Tre-

The institute also organized dedicated pedagogical classes, where graduates learned to be home tutors, teachers of Russian literature and French. Such classes "were intended to provide the most capable graduates of the general program, orphans in the first place, with an opportunity to prepare for teaching work during two years at public expense."[58] The two-year study program assumed learning the fundamentals of pedagogy and all the necessary disciplines during the first year (theory course) and taking turns in teaching to lower grades in the presence of an experienced instructor during the second year (practice course). The list of subjects in pedagogical classes testifies to the presence of a well-defined methodological system that involved cycles of didactic disciplines. Compulsory subjects for all students of pedagogical classes included Pedagogy, Didactics, Children's Literature, Hygiene, Jurisprudence, French, and Domestic Science.

To be admitted to pedagogical classes, students had to "have an average of at least 9 points in languages and sciences cumulatively for the last two years, provided that the number of points in each of those subjects is satisfactory, and at least 9 points in Russian and the subjects that she would like to select for in-depth study." [59] For example, a certificate issued on August 22, 1917 to the graduate Lydia Suplatova provided the following entitlement: "This is to certify that Lydia Suplatova, a Christian Orthodox, daughter of a lieutenant colonel, completed a seven-year program at Emperor Nicholas I Orenburg Women's Institute. As a student, she showed excellent behavior and achievements in the following subjects:

The Law of God very good, 11 points;
Russian language and literature good, 10 points;
French good, 10 points;
German good, 10 points;
Mathematics good, 10 points;
History good, 10 points;
Geography very good, 11 points;
Physics and Cosmography excellent, 12 points;
Pedagogy very good, 11 points;
Natural Science good, 10 points.

Thereby, Lydia Suplatova has the right to receive, without being subjected to additional tests, a certificate for the title of home tutor or

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tyego. Kn. 3. S1 yanv. 1891 po 20 okt. 1894 g. [Collected Legislations of the Office of the Institutions of Empress Maria. Vol. V: The Reign of His Majesty Emperor Alexander III, Book 3, January 1, 1891–October 20, 1894], St. Petersburg: State Publishing House, nos 2018–2646, p. 60.

[58] *Uchebnye zavedeniya Vedomstva uchrezhdeniy imperatritsy Marii: Kratkiy ocherk* [Educational Institutions of the Office of the Institutions of Empress Maria: A Brief Overview], St. Petersburg, 1906, pp. 57–58.

[59] SAOO. Fund no 87, inv. no 1, doc. no 9, p. 3.

teacher in the subjects in which she showed a high level of performance."[60]

The dedicated pedagogical classes selected not just high-performing students but those who fully satisfied the "teacher's higher purpose" criteria in terms of their moral qualities. The 8th (pedagogical) grade completion evaluation report of someone Mary Martin, who served at the institute for many years, states that "the maiden Mary Martin treated her studies quite conscientiously and developed a proper pedagogical tact, observation skills and a responsible attitude to didactic techniques."[61]

Having highly qualified teachers of foreign languages among the faculty allowed the institute to initiate classes for preparing foreign language teachers for women's gymnasiums, schools and home education of children. For example, the two-year program for teachers of French involved not only mastering the fundamentals of pedagogy but also a detailed study of the history and geography of France, comparative grammar, history of world (universal) literature, history of French literature, modern grammar and methodology of teaching French.[62]

With the introduction of pedagogical classes, the institute itself became a supplier of teaching professionals to local educational institutions—for instance, two administrators and some teachers of French and Russian at the 1st Orenburg Women's Gymnasium were graduates of Emperor Nicholas I Orenburg Women's Institute.

Completion of studies at the institute was marked with final exams and a ball. Each cohort of graduates, starting with the very first one in 1854, was praised for high performance in arts and sciences. The Report on Students' Performance and Behavior (no. 1297 of June 12, 1907) notes that out of 30 graduates in 1907, two received the highest award for excellent performance—maid of honor ciphers[63], two were granted gold medals, three got silver medals, and six were awarded books. In addition, "the maiden Zinaida Ryabkova received a silver medal to be worn on the ribbon of the Order of St. Vladimir for her philanthropic feat." [64] Unfortunately, archival materials do not specify the nature of the young girl's philanthropic feat.

After the February events of 1917, Emperor Nicholas I Orenburg Women's Institute found itself isolated and its funding significantly reduced and eventually terminated. In the fall of 1918, feeling trapped and hopeless, the headmistress and the pedagogical council of the

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[60] SAOO. Fund no 87, inv. no 1, doc. no 22.

[61] SAOO. Fund no 87, inv. no 1, doc. no 7, p. 4.

[62] SAOO. Fund no 87, inv. no 1, doc. no 18, p. 46.

[63] A maid of honor cipher represented the imperial cipher of Maria Feodorovna under a crown on the ribbon of the Imperial Order of Saint Alexander Nevsky. Emperor Nicholas I Orenburg Women's Institute was granted the right to present such awards to its best students in 1894.

[64] SAOO. Fund no 87, inv. no 1, doc. no 1.

institute addressed the military government of the Orenburg Cossack Host, raising a question about the prospects for the institute's accountability and subsequent development.

In September 1918, under the terms of reorganization, the institute was placed under the jurisdiction of the Orenburg Cossack Host and renamed into Orenburg Host Women's Institute[65]. The history of Emperor Nicholas I Orenburg Women's Institute ends in early 1919—like most institutions of this type, it turned out to be superfluous and unfitting into the new government's education paradigm.

Among the few surviving memoirs of the institute's graduates, there is not a single one in which the girls would speak negatively about their alma mater or complain about being severely punished or humiliated. The high standards of teaching and moral atmosphere at the institute are explained by a number of circumstances: the institution was under the constant supervision and tutelage of the Office of the Institutions of Empress Maria and members of the imperial family; the morals and general order were monitored by the headmistress and the board of trustees; teacher and governess candidates were thoroughly selected by their professional and personal qualities, which excluded recruitment of random or incompetent people; for many girls, being a student of the institute had a huge social value and was their only opportunity to get a decent education and build a life. The government of Orenburg Governorate also tried to support the high reputation of the institute in every possible way, as it had a direct influence on its own prestige and popularity.

Conclusion   Emperor Nicholas I Orenburg Women's Institute joined the ranks of Russian women's institutes and boarding schools in the mid-19th century. Its goal was to provide girls with general secondary education, spiritual, moral and aesthetic education, and practical teaching skills. Through the efforts of several generations of teachers and devoted support of the government, a unique educational phenomenon was fostered in Orenburg Governorate to educate women of a new culture.

The history of the origin and development of the institute proves that an understanding of the significance and value of female education was gradually and firmly established across different classes of Russian society. Emperor Nicholas I Orenburg Women's Institute had undeniable advantages over other institutions of women's education in Orenburg and Orenburg Governorate in the quality of education and good manners taught, equipment and maintenance, size of tuition fees, and boarding school opportunities. Girls learned teaching and language skills at the institute, which thus played an invalua-

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[65] Report of the Military Government of the Orenburg Cossack Host to the Emergency Cossack Assembly dated September 19, 1918 [no place, 1918], p. 66.

ble role in the professional socialization of orphans and children from low-income families.

References

Dneprov E., Usacheva R. (2009) *Zhenskoe obrazovanie v Rossii* [Female Education in Russia], Moscow: Drofa.

Kapterev P. (1915) *Istoriya russkoy pedagogii* [History of Russian Pedagogy], Petrograd: Zemlya.

Likhacheva E. (1899) *Materialy dlya istorii zhenskogo obrazovaniya v Rossii (1086–1856)* [Materials for History of Female Education in Russia (1086–1856)], St. Petersburg: Mikhail Stasyulevich's Publishing House.

Ponomareva V. (2018) "Orenburgskiy Nikolaevskiy institut dlya vospitaniya devits"—forpost zhenskogo obrazovaniya na vostoke Rossii [Emperor Nicholas I Orenburg Women's Institute as an Outpost of Female Education in Eastern Russia]. Proceedings of the international academic conference 9th Bolshakov Literary Soirée: Orenburg Region as a Historical and Cultural Phenomenon, Orenburg: Orenburg State Pedagogical University, pp. 350–353.

Ponomareva V., Khoroshilova L. (2017) Mir russkoy zhenshchiny: vospitanie, obrazovanie, sudba. XVIII—nachalo XX v. [The World of the Russian Woman: Upbringing, Education, Fate. XVIII—Beginning of XX Century]. Moscow: Russkoe slovo.

Starikov F. (1891) Istoriko-statisticheskiy ocherk Orenburgskogo kazachyego voyska [Historical and Statistical Essay of the Orenburg Cossack Army]. Orenburg: Tipo-litogr. B. Breslin.

Stoyunin V. (1892) *Pedagogicheskie sochineniya* [Pedagogical Writings], St. Petersburg: St. Petersburg College for the Deaf.

Cultural Traditions and Innovations in Education Reforms
Review of the book: Vanhemping E., Novak M. Innovative Practices and Civic Initiatives in Teaching Generation Z, 2020[1]

Authors

Valentina Kurganskaya
Doctor of Sciences in Philosophy, Professor, Leading Researcher, Institute for Philosophy, Political Science and Religion Studies under the Science Committee of the Ministry of Education and Science of the Republic of Kazakhstan.
E-mail: vkurganskaya@mail.ru

Mukhtarbek Shaikemelev
Doctor of Sciences in Philosophy, Head of the Department of Political Science, Institute for Philosophy, Political Science and Religion Studies under the Science Committee of the Ministry of Education and Science of the Republic of Kazakhstan.
E-mail: muhtarbek64@mail.ru

Address: 29 Kurmangazy Str., 050010 Almaty, Republic of Kazakhstan.

Abstract

The monograph *Innovative Practices and Civic Initiatives in Teaching Generation Z* by Elina Vanhemping and Maria Novak summarizes the authors' experience of working in the education systems of Kazakhstan, Russia and Finland, identifies innovative trends in the three countries and analyzes the education reforms administered during the period of social transformations in the Russian Empire and in present-day former Soviet republics. The authors bring up the question of why the Bologna recommendations fail to be implemented in the education systems of Kazakhstan and Russia for discussion by the academic and teaching community and propose a scenario for including the two countries in the global educational environment with due account taken of the peculiarities of their historical and cultural development.

Our review mainly focuses on the philosophical aspects of university and school reformation issues discussed in the monograph as well as on the relationship between cultural and historical traditions and innovations in theories of liberal arts education.

References

Becker J. (2015) Obrazovanie po sisteme svobodnykh iskusstv i nauk: otvet na vyzovy XXI v. [Liberal Arts and Sciences Education: Responding to the Challenges of the XXIst Century]. *Voprosy obrazovaniya/Educational Studies Moscow*, no 4, pp. 33–61. DOI:10.17323/1814-9545-2015-4-33-61.

Gessen S. (1995) *Osnovy pedagogiki. Vvedenie v prikladnuyu filosofiyu* [Fundamentals of Pedagogy. Introduction to Applied Philosophy]. Moscow: Shkola-Press.

Hayek F. A. (1992) *Pagubnaya samonadeyannost. Oshibki sotsializma* [The Fatal Conceit. The Errors of Socialism]. Moscow: Novosti with the participation Catallaxy.

---

[1] St. Petersburg: Publishing Press Association, 2020. 246 p.

Kurennoy V. (2020) Filosofiya liberalnogo obrazovaniya: printsipy [Philosophy of Liberal Education: The Principles]. *Voprosy obrazovaniya/Educational Studies Moscow*, no 1, pp. 8–39. DOI:10.17323/1814-9545-2020-1-8-39.

Lyotard J.-F. (1984) *The Postmodern Condition: A Report on Knowledge*. Minneapolis: University of Minnesota.

Mamardashvili M., Solovyov E., Shvyrev V. (1972) Klassika i sovremennost: dve epohi v razvitii burzhuaznoj filosofii [Classics and Modernity: Two Epochs in the Development of Bourgeois Philosophy]. *Filosofiya v sovremennom mire. Filosofiya i nauka* [Philosophy in the Modern World. Philosophy and Science], Moscow: Nauka, pp. 28–94.

Marx K. (1968) Ekonomicheskie rukopisi 1857–1861 gg. V 2 ch. Ch. 1 [Economic Manuscripts of 1857–1861. In Two Parts. Part I]. *K. Marx, F. Engels. Sochineniya* [K. Marx, F. Engels. Collection of Works], vol. 46, part I. Moscow: Politizdat.

Pico della Mirandola D. (1996) Rech o dostoinstve cheloveka [Oration on the Dignity of Man]. *Chasha Germesa: Gumanisticheskaya mysl epohi Vozrozhdeniya i germeticheskaya traditsiya* [The Cup of Hermes: The Humanistic Thought of the Renaissance and the Hermetic Tradition], Moscow: Yurist, pp. 215–216.

Plato (1999) Pisma [Letters]. *Plato. Zakony* [Laws], Moscow: Mysl, pp. 460–516.

Solovyov E. (1991) *Proshloe tolkuet nas. Ocherki po istorii filosofii i kultury* [The Past Interprets Us. Essays on the History of Philosophy and Culture]. Moscow: Politizdat.

Vanhemping E. G., Novak. M.A. (2020) *Innovacionnye praktiki i grazhdanskie iniciativy v obrazovanii pokoleniya Z* [Innovative Practices and Civic Initiatives in Generation Z Education]. Saint-Petersburg: Publishing and Printing Association of Higher Educational Institutions.

Populist Representations of Russia's Education Reforms in the Russian Media

Author   **Iliya Kiriya**
Candidate of Sciences in Philosophy, PhD, Professor, School of Media, National Research University Higher School of Economics.
Address: 2/8 Khitrovsky Ln, 109028 Moscow, Russian Federation.
E-mail: ikiria@hse.ru

Abstract   Educational change and policy have been greatly simplified and popularized by Russian media, which results in the reproduction of superficial perceptions of the education system, its goals and actors, preventing Russian public from getting the sense of reforms and processes within the system. Representations of education policy in top-rated media are reduced to celebrations of national achievements and criticism of commercialization trends in higher education. This article analyzes the historical, cultural and structural factors behind the populist representations of education policy in Russian media, including the specific functions of the latter in the context of the enlightenment policy inherited from the Soviet era and the heavy dependence of commercialized media on the mass consumer of information. Those factors complicate the public debate on education policy, making it the prerogative of narrow elite groups.

The article also describes the key popular frames used by media, including online media, associated with representations of higher education policy in Russia.

Keywords   education policy, educational reforms, Russian media landscape, public debate, social stereotypes.

References Ademukova N., Dovbysh O., Kiriya I., Chumakova V. (2017) Rol gosudarstvennykh kontraktov v modelyakh sotsialnoy otvetstvennosti regionalnykh mass-media v Rossii [The Role of State Contracts in Shaping Social Responsibility among Russia's Regional Mass Media]. *The Journal of Social Policy Studies*, vol. 15, no 1, pp. 81–96.

Althusser L. (2014) *On the Reproduction of Capitalism. Ideology and Ideological State Apparatuses*. London: Verso.

Anderson G. (2007) Media's Impact on Educational Policies and Practices: Political Spectacle and Social Control. *Peabody Journal of Education*, vol. 82, no 1, pp. 103–120.

Baker M. (1994) Media Coverage of Education. *British Journal of Educational Studies*, vol. 42, no 3, pp. 286–297.

Bodrunova S., Litvinenko A. (2016) Fragmentation of Society and Media Hybridisation in Today's Russia: How Facebook Voices Collective Demands. *Journal of Social Policy Studies,* vol. 14, no 1, pp. 113–124.

Bogomazova L. (2019) Ekonomicheskiy krizis v rossiyskikh SMI: konstruirovanie i dekonstruirovanie problem [The Economic Crisis in the Russian Mass Media: Constructing and Deconstructing Problems]. *Journal of Economic Sociology*, vol. 20, no 1, pp. 123–147.

Carrere d'Encausse H. (1981) *Decline of an Empire*. London: Harper Collins.

Castells M. (2011) *Communication Power*. Oxford: Oxford University.

Coe K., Kuttner P. (2018) Education Coverage in Television News: A Typology and Analysis of 35 Years of Topics. *AERA Open*, vol. 4, no 1, pp. 1–13.

Coyne Ch., Leeson P. (2004) Read All about It! Understanding the Role of Media in Economic Development. *Kyklos*, no 57, pp. 27–44.

Durkheim E. (1956) *Education and Society.* Glencoe, Il: Free Press.

Entman R. (1993) Framing: Toward Clarification of a Fractured Paradigm. *Journal of Communication,* vol. 43, no 4, pp. 51–58.

Etling B., Alexanyan K., Kelly J., Faris R., Palfrey J., Gasser U. (2010) *Public Discourse in the Russian Blogosphere: Mapping RuNet Politics and Mobilization*. Cambridge, MA: Berkman Center for Internet and Society, Harvard University.

Fairclough N. (1995) *Media Discourse*. New York, NY: Bloomsbury.

Farber P., Provenzo E., Holm G. (eds) (1994) *Schooling in the Light of Popular Culture*. Albany, NY: State University of New York.

Fiske J. (1990) *Understanding Popular Culture*. London: Routledge.

Fitzpatrick Sh. (1979) *Education and Social Mobility in the Soviet Union (1921– 1934).* Cambridge: Cambridge University.

Gerstl-Pepin C.I. (2002) Media (Mis)Representations of Education in the 2000 Presidential Election. *Educational Policy*, vol. 16, no 1, pp. 37–55.

Gramsci A. (2011) *Prison Notebooks.* New York: Columbia University.

Hall S. (1980) Encoding/Decoding. *Culture, Media, Language: Working Papers in Cultural Studies* (eds S. Hall et al.), London: Hutchinson, pp. 128–138.

Herman E., Chomsky N. (2002) *Manufacturing Consent: The Political Economy of the Mass Media.* New York: Pantheon.

Howell W. (2008) Education Policy, Academic Research, and Public Opinion. *When Research Matters: How Scholarship Influences Education Policy* (ed. F. Hess), Cambridge, MA: Harvard Education Press, pp. 135–153.

Jenkins H. (2006) *Convergence Culture: Where Old and New Media Collide*. New York: NYU.

Kiriya I. (2012) The Culture of Subversion and Russian Media Landscape. *International Journal of Communication*, vol. 6, no 1, pp. 446–466.

Kiriya I. (2017) The Impact of International Sanctions on Russia's Media Economy. *Russian Politics*, vol. 2, no 1, pp. 80–97.

Kiriya I. (2018) Russian Media. *Russia: Strategy, Policy and Administration* (ed. I. Studin), London: Palgrave McMillan, pp. 97–104.

Kiriya I. (2019) New and Old Institutions within the Russian Media System. *Russian Journal of Communication*, vol. 11, no 1, pp. 6–21.

Knight A. (2008) Journalism in the Age of Blogging. *Journalism Studies*, vol. 9, no 1, pp. 117–131.

Krämer B. (2014) Media Populism: A Conceptual Clarification and Some Theses on its Effects. *Communication Theory,* vol. 24, no 1, pp. 42–60.

Kumashiro K. (2008) *The Seduction of Common Sense: How the Right Has Framed the Debate on America's Schools*. New York, NY: Teachers College.

Lasswell H. D. (1960) The Structure and Function of Communication in Society. *Mass Communications* (ed. W. Schramm), Urbana, IL: University of Illinois, pp. 117–129.

Lebina N. (2018) *Sovetskaya povsednevnost: normy i anomalii ot voennogo kommunizma k bolshomu stilyu* [Soviet Everyday Life: Norms and Anomalies from War Communism to Big Style]. Moscow: Novoe literaturnoe obozrenie.

McChesney R. (2000) *Rich Media, Poor Democracy: Communication Politics in Dubious Times*. New York: New Press.

Nygren G., Dobek-Ostrowska B. (eds) (2015) *Journalism in Change: Journalistic Culture in Poland, Russia and Sweden*. Oxford: Peter Lang.

Rhoades G., Rhoades L. (1987) Agenda-Setting and the News: Implications for Teacher Education. *Action in Teacher Education*, vol. 9, no 2, pp. 39–42.

Stack M., Boler M. (2007) Media and Policy in Education. *Policy Futures in Education*, vol. 5, no 1, pp. 1–16.

Tillman L. C., Trier J. (2007) Boston Public as Public Pedagogy: Implications for Teacher Preparation and School Leadership. *Peabody Journal of Education*, vol. 82, no 1, pp. 121–149.

Van Dijk T. (2008) *Discourse and Context: A Socio-Cognitive Approach*. Cambridge: Cambridge University.