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Address
National Research University Higher School of Economics
20 Myasnitskaya St., Moscow, Russia 101000
Tel: +7 (495) 772 95 90 *22 037, *22 038
E-mail: edu.journal@hse.ru
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Towards the New Model of Doctoral Education:

The Experience of Enhancing Doctoral Programs in Russian Universities

N. Maloshonok, E. Terentev

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Natalia Maloshonok
Candidate of Sciences in Sociology, Senior Research Fellow, Director of the Center of Sociology of Higher Education, Institute of Education, National Research University Higher School of Economics. Email: nmaloshonok@hse.ru
Evgeniy Terentev
Candidate of Sciences in Sociology, Senior Research Fellow, Center of Sociology of Higher Education, Institute of Education, National Research University Higher School of Economics. Email: eterentev@hse.ru

Address: 20 Myasnitskaya St, 101000 Moscow, Russian Federation.

Abstract. In the era of knowledge-based economy, improving the quality and efficiency of doctoral programs is a key aspect of ensuring economic growth and national competitiveness in the global arena. Doctoral education in Russia today is redefining its goals and organizational models in light of global challenges as well as the revised Federal Law On Education in the Russian Federation and the new Regulations on Awarding Academic Degrees. This transitional period, complicated with low completion rates and institutional problems, contributes to the urgency of devising improvement practices for doctoral education. Interviews with doctoral students and doctoral program administrators are used to analyze Russian universities' practices designed to enhance doctoral studies. Those practices are grouped in accordance with the traditionally identified aspects of doctoral education that are directly related to its success: admissions, graduate curriculum, supervision, monitoring progress, financial support, institutional climate, practices and procedures. The article also discusses the opportunities for disseminating best practices to improve doctoral education as well as the restrictions that must be taken into account.

Keywords: doctoral programs, improving doctoral education, education policy, best practices, exchange of experience.

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Achieving a critical number of innovations is key to maintaining a country's competitive power and consolidating a leading position in the global arena. This requires an array of highly qualified professionals who are not only narrowly specialized but also possess some universal competencies [Nerad 2006; 2010; Pearson, Evans, Macauley 2008; Pearson 2005; Lee, Brennan, Green 2009]. Doctoral education is a fundamental component in training skilled workforce to foster economic

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and social development almost everywhere around the globe [Nerad, Heggelund 2011; Pearson, Evans, Macauley 2016], so finding and disseminating ways to improve doctoral education are vitally important.

Doctoral education in Russia is currently redefining its goals and organizational models [Maloshonok, Terentev 2019]. On the one hand, this transitional period is explained by the influence of some global trends, such as internationalization [Halse 2007; Nerad 2006; Nerad, Evans 2014] and massification of higher education [Marginson 2004; Nerad 2006], and by the spread of liberal ideas and the discourse on productivity in higher education [Olssen, Peters 2005; Zepke 2015]. On the other hand, transition has been instigated by the national education policy in training academic workforce and the adoption of two laws, the revised Law On Education, which came into force in 2013 and changed both the formal status of doctoral education and the doctoral curricula, and the revised Regulations on Awarding Academic Degrees, which came into force in 2014 and tightened the requirements for admission to doctoral studies. In addition, a number of leading Russian universities were entitled to award academic degrees of their own in 2017, which has changed significantly the rules of doctoral admission and education as well as the degree awarding procedure. That is to say, the global trends and national education policy are shaping conditions to which doctoral programs should respond by changing their curricula, student and faculty training requirements, on the one hand, while on the other such newly emerging conditions create limitations for reforms and qualitative improvements in doctoral education.

The reformation of Russian doctoral education has been discussed in scientific literature [Bedny, Rybakov, Sapunov 2017; Bedny 2017; Maloshonok, Terentev 2019]. In particular, scholars raise questions about the falling (since 2013) thesis completion rates, legal differentiation between defending a thesis and earning a certificate of the completion of a doctoral program, increased doctoral student workload, etc. [Bedny, Rybakov, Sapunov 2017; Mironos, Bedny 2016]. It should be admitted that many of the existing doctoral education issues—such as high attrition rates, challenges associated with academic writing and ensuring research productivity, financial support, and the match between doctoral graduates' skills and employers' requirements—occurred before the transition period [Balabanov, Bedny, Mironos 2007; Bedny, Mironos 2008]. However, they have grown more acute following the transformation of doctorate and tightening of doctoral student requirements and now need to be urgently addressed and tackled.

The article investigates into the practices developed at the level of universities and doctoral programs in response to the challenges mentioned above and designed to enhance the quality of doctoral training. Special attention is given to the perceptions of candidates and doctoral program administrators about the measures that could improve the quality of doctoral education and the conditions for research and thesis writing.

1. Enhancement of Doctoral Programs

Issues associated with improving program quality and completion rates in doctoral education have been addressed by a number of researchers worldwide [Lipschutz 1993; Ali, Kohun, Levy 2007; Pena et al. 2010; Di Pierro 2007; 2012]. Seven aspects of doctoral studies that should be altered to increase doctoral completion rates are examined [Lipschutz 1993]: admissions, graduate curriculum, supervision, monitoring progress, financial support, institutional climate, practices and procedures.

Below, we give a short overview of the measures that could be taken to improve each of those aspects of doctoral education. Available findings mostly describe advanced systems of higher and doctoral education, such as those in the United States, Great Britain, Australia, and several European countries, so our review of best practices will be limited to the experience of those countries.

1.1. Admission

In a number of countries, unlike in Russia, universities and their constituent units (faculties, departments, etc.) are free to establish their own application procedures and admission requirements. Normally, the factors considered include motivation for doctoral studies and research, academic and professional background, participation in various projects, and student readiness. The latter is often measured with dedicated standardized tests, such as Graduate Record Examinations (GRE) in the United States. A series of studies prove the GRE test valid based on a positive correlation with graduate great point average [Kuncel, Hezlett, Ones 2001], while others do not find this test to be a good predictor of doctoral student success [Moneta-Koehler et al. 2017].

Susan S. Lipschutz [Lipschutz 1993] recommends paying attention to the candidate characteristics that correlate positively with doctoral degree completion and trying to answer the following questions when making admissions decisions: is the candidate motivated enough? will they be able to excel in challenging courses without assistance? are they able to manage situations of uncertainty? how realistic are their perceptions of doctoral education and academic work? Answers to those questions could be found with the help of recommendation letters and interviews with professors and current doctoral students. Lipschutz believes that current doctoral students' evaluations of applicants may prove very useful, as current students' perceptions of the qualities necessary for successful research degree completion are based on their own significant related experience.

1.2. Doctoral Curriculum

Nearly in every country, doctoral education includes two fundamental elements [Peña et al. 2010]: (i) coursework, which is structured familiarly for students and is relevant to their Bachelor's or Master's academic degree experience, and (ii) thesis writing, which is perceived as a new type of activity by students. With coursework, enhancement measures are designed to increase its effectiveness in developing

professional and generic, or transferable, skills that are in demand in both academic and nonacademic labor markets [Gilbert et al. 2004; Griffiths et al. 2018]. Dedicated courses have been introduced in doctoral studies to inculcate such skills and expand employment opportunities for doctoral graduates. Besides, a lot of countries have diversified their academic tracks and now differentiate between the PhD and designated professional doctorate [Boud, Tennant 2006] to bridge the gap between doctoral education and real labor required from research degree holders [Gaff 2002]. Therefore, best practices within this aspect of doctoral education have come to involve being guided by the economy and labor market demand for graduate competencies as well as ensuring graduate curriculum flexibility and diversification in order to meet that demand.

1.3. Supervision and Monitoring Progress of Doctoral students

Low quality of doctoral supervision and/or inadequate frequency of student-supervisor interaction have a negative impact on the doctoral student outcomes and thesis completion [Cornér, Löfström, Pyhältö 2017], whereas supervisor support leads to better academic progress [Martinsuo, Turkulainen 2011].

In addition, monitoring the progress of doctoral students is a critical factor of their research productivity, and the key role here should be played by the supervisor [Lipschutz 1993]. Not only should supervisors help candidates actually write a thesis (provide advice on relevant literature, assist them in designing empirical research projects, comment on the work done, etc.), but they are also expected to act as "project managers" whose functions include setting deadlines, ensuring that those deadlines are met, and providing progress and final assessment of doctoral research [Lindsay 2015]. As a business manager, the supervisor must weight all the pros and cons of alternative decisions, select the best possible path to achieve the goal in the most efficient way, and guide their student along that path, controlling their pace of progress [Vilkinas 2002].

The following is used today to enhance doctoralsupervision: supervisor performance evaluation, supervisor accreditation, introduction of dedicated supervisor development programs [Pearson, Brew 2002; McCallin, Nayar 2012; McCulloch, Loeser 2016; Lee 2018], and adoption of a workplace supervision policy allowing to bridge education and work effectively [Maguire, Prodi, Gibbs 2018]. Specialized programs for supervisor development as well as guidelines, roadmaps, and regulations help supervisors determine their areas of responsibility and objectives to be achieved during doctoral supervision [Lipschutz 1993].

A large body of literature on improving doctoral supervision is devoted to matching doctoral students with supervisors [Ives, Rowley 2005; Orellana et al. 2016] and collecting and using student feedback [Marsh, Rowe, Martin 2002; Mainhard et al. 2009]. There are also studies identifying the attributes of supervisors and supervision

that have positive effects on doctoral student experience and degree completion [Grant, Hackney, Edgar 2014; Ali, Watson, Dhingra 2016; Taylor et al. 2018; Fillery-Travis, Robinson 2018].

Research findings show that supervision quality is positively related to the practices of team supervision, i. e. supervision by two or more academics [Olmos-López, Sunderland 2017; Nordentof, Thomsen, Wichmann-Hansen 2013], and mentoring [Noonan, Ballinger, Black 2007]. With the latter, scholars usually discriminate between faculty and peer mentoring programs [Holley, Caldwell 2012].

There is empirical evidence that doctoral students who had faculty mentors tend to be more employable and enjoy more education opportunities contributing to their professional socialization [Lyons, Scroggins 1990; Rose 2005; Zachary 2000], and they also demonstrate better research skills and productivity [Kram 1985; Paglis et al. 2006; Rose 2005; Terrell, Wright 1988]. On the whole, mentoring programs in doctoral education have been shown to have a positive impact on degree completion rates [Maher, Ford, Thompson 2004; Wunsch 1994].

Similar effects are observed for peer mentoring programs (where mentoring is provided by established doctoral students), which improve candidates' perceptions of learning environment safety and friendliness [Bonilla, Pickron, Tatum 1994]. Such programs also contribute to higher thesis completion rates [Dorn, Papalewis, Brow 1995].

1.4. Financial Support

University's financial support is often approached as the key factor of doctoral student success [Zhou, Okahana 2016]. A number of studies reveal a significant relationship between financial support and doctoral completion [Ehrenberg, Mavros 1992; Valero 2001; Mendoza, Villarreal, Gunderson 2014; Ampaw, Jaeger 2012; Zhou, Okahana 2016].

The following types of financial support are identified [Gillingham, Seneca, Taussig 1991; Valero 2001]: research assistantship, teaching assistantship, and university-funded fellowship. The latter is used to attract the most talented students, while assistantships enrich doctoral students' learning experiences and promote their professional socialization and integration in the university community [Girves, Wemmerus 1988].

Assistantships are regarded as a more productive type of financial support than fellowships, as they are more conducive to overcoming academic isolation [Ibid.]. Teaching assistantship was found to be a stronger predictor of degree completion than university-funded fellowship [Bowen, Rudenstine 1992]. Research assistantships have the highest likelihood of degree completion compared to other forms of financial support [Ampaw, Jaeger 2012]. In addition, doctoral candidates who were funded primarily as research assistants are significantly more likely to take research-focused jobs in the scientific workforce after graduation, as compared to candidates who were primarily supported by fellowships [Blume-Kohout, Adhikari 2016].

1.5. Institutional Climate

Some characteristics of the doctoral program learning environment may be demotivating and detrimental to research productivity. According to Lipschutz [Lipschutz 1993], this includes being underestimated by supervisor, discriminated or neglected by peers and faculty, and facing hostility and intimidation on the part of professors and supervisors. Researchers around the world investigate institutional climate as a factor of doctoral attrition [Nerad, Miller 1996]. Empirical studies have shown that positive perception of learning environment is related positively with academic achievement [MacNeil, Prater, Busch 2009], student satisfaction [Umbach, Porter 2002], and degree completion [Oseguera, Rhee 2009], ensuring a more comfortable transition to the academic career [Louis et al. 2007].

1.6. Practices and Procedures

Practices and procedures include doctoral program characteristics that facilitate thesis progress and reduce time to degree [Lipschutz 1993]. A number of studies indicate that promotion of research competencies, academic writing and research paper structuring skills may have a positive influence on doctoral student success as well as time to degree completion [Brush et al. 2003; Park 2007]. With that in mind, some universities set up dedicated courses and workshops in which doctoral students learn to write literature reviews and grant applications, design research programs, select data analysis methods, write and present theses and research papers [McCallin, Nayar 2012]. Increasing the frequency of research seminars has also proved to be a powerful pedagogic practice [Brush et al. 2003], as this format allows creating a productive learning environment for knowledge sharing and constructive thesis discussion [Malfroy 2005].

A whole range of practices seek to overcome social and professional isolation of doctoral candidates. Peer writing groups, in which students get to talk about their writing, are an efficient way of mitigating such isolation [Kamler, Thomson 2006]. Learning in writing groups occurs both at an individual (during writing or reading) and collective (through discussion and peer feedback) level [Aitchison 2009].

Integration into the field-specific scientific community at a regional, national and global level can be an effective way of overcoming isolation in doctoral candidates. Through partnerships, joint projects, and reciprocal visits, students extend opportunities for developing their research competencies and working on their thesis, which has a positive impact on their research productivity [Pearson, Evans, Macauley 2016].

Obviously, universities around the globe have accumulated experience in enhancing doctoral programs and increasing their effectiveness, the latter being measured by degree completion rates and research productivity indicators. The study described below was designed to identify the doctoral education enhancement practices utilized by Russian universities.

2. Research Method and Data Collection

The article draws on the data collected during the research project Doctoral Education in the Project 5–100 Universities: Current State Analysis and Strategies for Development. Research under this project, ordered by the Ministry of Education and Science of the Russian Federation, was conducted in March–April 2016. Its goal was to explore the doctoral education issues faced by the Project 5–100 universities and to identify best practices for solving them. Twenty interviews with doctoral candidates and 11 with doctoral program administrators were collected for the purpose of research.

Interviews with doctoral students were conducted at 11 universities (1–3 interviews in each). The sample was designed to include a variety of fields, stages and modes of study. The breakdown by stages was the following: seven students in the first year of doctoral studies, eight in the second, and five in the third year and beyond. As for the field structure, eight respondents were pursuing doctoral programs in physics and technology, six in sociology and economics, two in mathematics, one in chemical sciences, and one in legal studies. The interview guide consisted of general questions and seven substantive modules: (i) previous educational and research experience; (ii) admission to doctoral studies; (iii) attitude towards research and motivations for earning a doctoral degree; (iv) coursework; (v) off-campus employment; (vi) supervision experiences; and (vii) career aspirations. The average length of an interview was around 60 minutes. The students were interviewed face-to-face, on Skype, and by phone.

Interviews with doctoral program administrators also covered 11 universities (one respondent in each). The interview guide involved general questions and six substantive modules: (i) the policy of attracting and selecting students to doctoral programs; (ii) the problems that the university encounters in candidate attraction and selection; (iii) the composition of doctoral students at the university; (iv) educational technology used in the university's doctoral programs; (v) mechanisms of engaging doctoral students in research projects; research conditions; (vi) research productivity and practices to improve it. The respondents were interviewed face-to-face, on Skype, and by phone. The average length of an interview was around 60 minutes.

3. Challenges of Contemporary Doctoral Education in Russia and How Leading Universities Overcome Them

Analysis of the interview transcripts along with the recent findings on doctoral education in Russia [Bedny, Rybakov, Sapunov 2017; Bedny 2016; 2017; Bekova et al. 2017; Gruzdev, Terentev 2017; Maloshonok, Terentev 2019] allow identifying the key "sore spots" of the faculty training system within the framework of the seven aspects of doctoral education [Lipschutz 1993].

1. Admissions: ineffective selection procedures.
2. Graduate curriculum: "blurred" boundaries between the research and pedagogical components.

3. Supervision: flawed supervisor assignment mechanisms and lack of progress monitoring.
4. Financial support: lack of effective mechanisms.
5. Institutional climate: unfavorable conditions for productive learning and research activities.
6. Practices: lack of competencies required in the academic and nonacademic labor market.

Below, we are going to dwell on each of the problems listed above, outlining their nature and the practices that Russia's leading universities use to solve them. Since the article seeks to find ways to overcome the existing problems, the titles of structural units in this article describe not problems but directions for solving them. Some of the identified issues and possible solutions are subject to discussion; by outlining them this way, we follow the respondents' opinions. The final part of the article explores the opportunities and limitations associated with introducing the practices singled out, comparing Russia's doctoral education experience to that of other countries.

3.1. Admissions: Diversify the Candidate Selection System

The new model of doctoral education suggests a more flexible system of candidate selection for all educational and research institutions. Universities have been granted more freedom in setting their admission standards and determining the format of admission tests. Because the new regulations have only been in force since 2017, it is impossible to evaluate their effectiveness yet. However, doctoral program administrators emphasized in the interviews that under the existing circumstances they often have to recruit random candidates, especially if the educational or research institution receives a lot of doctoral applications from other colleges.

> "Now, we are required to increase the number of doctoral students from other institutions. Given the specific nature of our research, this is of little interest to supervisors because they are basically buying a pig in a poke—they know nothing about students' capabilities and competencies." (*head of department of doctoral education and faculty evaluation*)

Some universities introduce complementary personal achievement evaluation tools to get to know their applicants better and stimulate those with stronger research background. Achievements considered in the selection process include, first of all, publications and participation in scientific conferences.

> "All of our applicants submit a record of their publication activity, inventions, research reports, and conference participation. This does not replace admission tests but counts as an added value and

has a certain weight in the selection process." (*head of department of doctoral studies*)

Besides, in some institutions, applicants to doctoral programs are asked to write an essay on the assumed thesis topic. Such essays allow admissions officers to see how deep the candidate is into the topic, evaluate the quality of research already done on the topic, and assess the candidate's writing skills, which are a critical predictor of successful thesis completion.

"Apart from admission tests, we also ask applicants to write an essay reviewing the assumed field of doctoral research, which provides a framework for the prospective thesis and features analysis of the contemporary trends in the field, research goals and objectives, and a well-grounded theoretical and applied rationale." (*head of department of international doctoral programs*)

3.2. Graduate Curriculum: Separate the Academic Tracks

The current model of doctoral education implies that graduates are qualified as "teacher-researchers". This captures perfectly the way the educational process is structured—to embrace both tracks and teach research as well as pedagogical skills. In addition to courses in thesis-related disciplines, history and philosophy of science, academic writing and scientific communication, doctoral candidates are obliged to undergo teaching internships and take the Fundamentals of Pedagogy course. Candidates as well as doctoral program administrators believe that such goal "diffusion" is unjustified and decreases the effectiveness of doctoral programs.

"Doctoral studies should be aimed at training scientific workforce—young researchers who are willing to develop as scientists, to do something meaningful out there—but not teachers." (*first-year doctoral student in physics and technology*)

Judging by the interview transcripts, most doctoral candidates entered the doctoral program either to start a research career and write a thesis or to learn pedagogical skills—and the mix of the two tracks impairs performance in both. Some respondents stressed the need to separate the two components of doctoral education into independent tracks.

"There should be separate standards for teachers and researchers. Not everyone wants to teach. Some faculty members are rather reserved and want no communication with students. People like that do not need the teaching component at all. They are scientists, they will complete their degree on time, they will do everything because they are passionate about it. But there is no need mixing apples and oranges. There are the research-only type, their mission

> is to advance the development of science, but they are downright incapable of teaching what they themselves have come up with." (*head of department of doctoral studies*)

As long as both the research and teaching components are obligatory in the existing format of doctoral education (Fundamentals of Pedagogy course and teaching internships at the bare minimum), universities resort to various tricks to allow doctoral students focus on one thing instead of spreading themselves between research and teaching practice. For instance, some institutions offer alternative teaching internship formats for candidates feeling unable or unwilling to teach.

> "As for the teaching component, we certainly try to engage everyone, but if someone is uncomfortable about it, we look for alternative teaching-related experiences. They may include creating teaching methodology materials, designing laboratory tasks, integrating one's research findings into the learning process and developing relevant study guides, etc. In the end, what can we do if someone is not fond of working in the classroom?" (*head of department of doctoral education*)

However, an alternative point of view was also stated in the interview transcripts, advocating complementarity and equal importance of research and teaching experiences in doctoral programs. The respondents who stick to that viewpoint consider the existing situation sensible.

> "A professional who can do research and get published should possess some teaching skills to assist students and disseminate their own findings." (*third-year doctoral student in sociology and economics*)

3.3. Supervision: Improve the Supervisor Assignment System and Introduce Team Supervision

The key role of supervision in doctoral education postulates that a systematic approach to supervisor selection or assignment must be elaborated. The interview results show that nearly one in five doctoral students experience difficulties in communicating with their supervisors, which inhibit their learning and thesis progress [Bekova et al. 2017]. Not infrequently, disharmonious supervising relationships result from random supervisor assignment, with no prior acquaintance or discussion of collaboration prospects. Consequently, such student-supervisor dyads are at a high risk of disagreements that may be generated by academic or nonacademic (such as psychological traits or communication behaviors) factors. If such disagreements surface when students are already deep into their doctoral studies and thesis, chances for degree completion will drop dramatically.

With a view to reduce the risk of mismatching doctoral students to supervisors and recruiting candidates unable to get integrated into the

local academic environment, some universities only admit their own graduates into doctoral programs. In a number of institutions, Master's degree students are encouraged to explore topics that can be elaborated later in doctoral programs. As a result, strong student-supervisor ties are formed during Master's studies.

> "Many of our supervisors also supervise Master's degree students. When we see talent, we advise choosing topics to allow Master's research to evolve into a doctoral thesis later on. To prevent their efforts from going down the drain. We always keep an eye on such promising students. <…> Monitoring them through supervisors and department directors." (*head of department of doctoral education and faculty evaluation*)

In addition, some universities make selecting an supervisor and obtaining supervisor consent prior to application one of their admission requirements, allowing applicants and supervisors to get to know each other and assess the prospects of collaboration. This way, "pig in a poke" situations are prevented, which is particularly important when candidates are graduates from another university.

> "The application procedure begins with the applicant examining the list of available supervisors on the website, selecting a desired topic, and contacting the academic directly. Next, the applicant comes for an interview, and if they are recommended for admission—we have a formal interview protocol—they proceed to admission tests." (*head of department of doctoral studies*)

Another major challenge in doctoral supervision has to do with the lack of tools for student progress monitoring. In the Russian model of doctoral education, thesis progress is monitored by a sole supervisor. Such concentration of supervision in the hands of one person increases the risk of failure dramatically, since the final result is largely contingent on supervisor interest and candidate perseverance.

> "It all depends on the quality of your relationships with the supervisor. <…> Everyone perceives doctoral programs as a closed box: a candidate is working on something for three years, and so is their supervisor, but the outcome depends on what drives those two." *(second-year doctoral student in sociology and economics)*

To increase the effectiveness of student progress monitoring, a number of universities implement team supervision practices, in particular workplace supervision for candidates employed off campus. In such cases, the candidate is assigned two supervisors, one in the university and the other in the employer's organization, and they both supervise the student at the same time.

> "We have joint programs with businesses—our strategic partners. <…> Doctoral students pursue internships and usually use employer's resources to conduct thesis-related experiments. They normally have two co-supervisors, one here and one at the workplace, who is most often also a professor of our university working there." (*head of department of doctoral studies*)

3.4. Financial Support Mechanisms

The results of a survey conducted in 14 Russia's leading universities in 2016 show that insufficient financial support is a major problem for two in three doctoral students [Bekova et al. 2017]. Small scholarships push students to look for an earnings-generating employment which is often mismatched to their thesis and research activity in general. According to the survey, 90% of doctoral students are employed off campus and nearly 75% of them find it challenging to combine work and study [Ibid.:35–36]. Meanwhile, only 45% of the employed respondents have jobs that are at least partly matched to their field of study. The gravity of this problem is also reflected in the interviews with doctoral students and program administrators.

> "I find it extremely difficult to engage in any research activity apart from the audits and exams, because I have to make a living. The scholarship of three thousand-odd rubles is totally inadequate." *(second-year graduate student in humanities)*

> "Pursuing a doctoral degree has never been easy, and now it is tougher than ever. It requires an enormous amount of time, which is hard to do, as students, especially younger ones, have to earn money." (*head of department of doctoral studies*)

Some of the Russian universities have developed two strategies to at least mitigate, if not eliminate, the problem. The first one consists in offering on-campus employment to doctoral students and engaging them in projects administered by the research departments. Not only does this practice provide doctoral students with a certain income but it also contributes to their professional socialization, expands their research project experience, and helps them collect data for their thesis. In this model, employment and doctoral activities are not competing but complementary; besides, faculty turnover is promoted.

> "This <on-campus employment of doctoral students> is a very good practice. First, they do not have to seek side jobs as they are paid by the university. Second, they contribute to university performance by writing research papers, which is encouraged by the existing policy. <…> When a first-year doctoral student is employed on campus, we can say that they are getting "hooked" from now on, as they become familiar with the community, its values, and in-

stitutional climate." *(head of department of doctoral education and faculty evaluation)*

The second strategy consists in elaborating dedicated funding programs for exceptionally promising candidates, which include grants and additional performance-based scholarships, as well as specialized educational programs implying high student commitment and a guaranteed extra scholarship. As a rule, admission to programs with large extra scholarships is based on a highly competitive selection process, so that only the most outstanding candidates benefit.

"In my case, embarking on a PhD meant <…> getting funds for my research projects. <…> There was a scholarship of 25,000 rubles, which was a serious contribution to my income back then." *(fourth-year doctoral student in sociology and economics)*

The two strategies are not mutually exclusive; in fact, they can complement each other. While being applied by some universities, they are not implemented on a massive scale despite their positive effects on time to degree completion and research skill development.

3.5. Institutional Climate: Build a Productive Learning and Research Environment

A critical aspect of doctoral program enhancement concerns creating a healthy institutional climate, which implies that students are not neglected or discriminated and have friendly relationships with peers, supervisors, and other faculty members. A negative institutional climate may demotivate doctoral students and inhibit their professional growth and research progress. The respondents did not mention institutional practices of maintaining a healthy psychological climate directly, but the importance of this parameter was obvious when students provided examples of supervisors and peers helping them tackle challenging academic tasks.

"Whenever I need advice on my research, I always get help and assistance. In fact, it is not only about assistance. When I was applying for a grant, I could easily come and ask for advice on what to do, how to sign documents, and even some formal issues irrelevant to research." *(second-year doctoral student in physics and technology)*

3.6. Practices and Procedures: Develop Academic Writing and Presentation Skills, Encourage Academic Mobility and Intra-University Collaborations

"I don't know about the others, but my supervisor is a jackpot. She has been so helpful. When I was having troubles with my article, re-writing it over and over, she was giving me as much psychological support as she could." *(second-year doctoral student in humanities)*

The Russian system of doctoral education is designed to train academics, so the existing candidate requirements include, along with

preparing a thesis, publishing two or three (depending on the field of research) articles in peer-reviewed journals and presenting one's thesis findings in at least one scientific conference. Meeting those requirements often becomes an impassable barrier to getting a degree, since a lot of candidates had no experience of writing articles for peer-reviewed journals prior to admission to doctoral programs. About half of the candidates experienced difficulties preparing and publishing articles in peer-reviewed journals from the Higher Attestation Commission's list [Bekova et al. 2017]. The gravity of this problem is reflected in the interviews with doctoral students, who underline the importance of developing academic skills during studies.

> "Students should be taught academic reading and writing skills as well as critical thinking skills in the first place—that should be the focus." *(second-year doctoral student in humanities)*

Mitigation practices implemented by some universities mostly consist in adding dedicated courses on writing and presentation skills to doctoral curricula. Such courses (usually Science Communication, Science Popularization, Academic Writing, and others) are designed to teach doctoral students the rules of academic writing and formal presentation in Russian and foreign languages, introducing them to the publishing procedure and guidelines, the fundamentals of oral academic communication (language, logic and standards of presentation, etc.) and findings presentation, etc.

> "We teach students how to present their findings in conferences, speak in public, engage in academic discussions, participate in debates, and prepare publications. In particular, we have the Science Communication course—this is a specific trend that has been a focus in Europe. We absorb this practice and try to integrate it into our doctoral programs." *(head of skilled workforce training department)*

> "The Popularization course was also of great use. They told us how to present our inventions and skills <...>, and also about advertising, about where to go, whom to speak to, and where to find information. As part of our practical work, we learned to fill out invention applications and other research-related documents <...>, so we can already apply this knowledge further on." (*second-year doctoral student in physics and technology*)

> "The course on academic writing was very useful. Last term, we were learning to fill out grant applications, so that those who had never done it before would see how it works, how it should be done. I had already had that experience—that was how I obtained my grant for studies in Maastricht last year. And I found out that the

> course could really be useful. I came away with some additional literature from the course bibliography to use in my academic writing." (*second-year doctoral student in humanities*)

In Russian universities, doctoral supervisor is most often the candidate's only "entry point", so the effectiveness of supervisor-student relationships largely determines student success or failure. Such organization of doctoral studies makes candidates overly dependent on their supervisors and relationships with them. Moreover, it results in academic isolation of doctoral students, who have to stew in their own juice. With all communication being mediated by the supervisor, a candidate has no opportunity to expand their research horizons or get additional external assessment of their progress.

A good way to reduce academic isolation is to encourage academic mobility in doctoral programs, allowing candidates to network, build new professional connections, and present their findings to a broader academic community.

> "We have funding for academic mobility. All doctoral candidates should go on one or two academic trips within Russia every year, whether for research purposes, or to attend a conference, or to present their thesis results." (*head of department of doctoral education and faculty evaluation*)

International student mobility, involving acquaintance and exchange of experience with foreign researchers, is considered the most productive type of academic mobility, according to the respondents (students as well as doctoral program administrators).

> "I believe that a perfect doctoral program must involve academic mobility, a very useful feature allowing to cooperate with scholars and research teams in other countries. Lately, all major studies have been conducted by international teams, which is much more productive than being restricted to only one lab." *(first-year doctoral student in physics and technology).*

Another strategy to mitigate academic isolation consists in using university's own resources to promote interaction with supervisors and peers. For example, one of the universities offers special intramural grants for inter-disciplinary doctoral research.

> "If you are applying for a grant, you do not necessarily have to invite researchers from your field of study. You might need, say, people with cross-disciplinary experience. For my first grant this fall, I needed someone with expertise in biology and chemistry. So what you need to do is reach out to doctoral students in other fields

and try to make connections. I believe it is a winning strategy for all." *(first-year doctoral student in physics and technology)*

To encourage student-faculty communication, universities often engage doctoral students in the activities of departments and research centers doing research relevant to their thesis topics. As the respondents indicate, this practice fosters professional socialization of doctoral candidates, helping them meet other professionals in their field as well as learn the academic values and standards.

"Our research departments offer positions for doctoral students so as to attract and retain young scientists at the university. <…> This allows young researchers to work with leading scholars, educators, and fellows." *(head of department of international doctoral programs).*

4. Opportunities and Limitations of Introducing the Practices Identified

Implementation of the practices described in the previous section involves overcoming a number of barriers, both systemic and institution-specific.

For example, there are legal restrictions on the diversification of academic tracks. To allow such diversification, institutions have to resort to circumventions, their actions sometimes being inconsistent with the unified principles of doctoral education stipulated by the federal law.

Recent changes in the Russian legislation have made it possible to lift some of the limitations. A number of faculty members interviewed in 2016 reported being restricted in setting doctoral admission requirements by law. In January 2017, the Ministry of Education and Science issued the Order "On Approving the Procedure for Admission to Doctoral Programs", which allows for considering applicants' individual attainment in the selection process, thus granting universities freedom in assigning priorities to different admission requirements. Nevertheless, with some minor exceptions, universities keep following the same old rules.

In addition, effectiveness and even possibility of implementing some of the practices depends on the institution's resources. It is obvious, in particular, that using additional sources of financial support for doctoral students is determined directly by the organization's financial status. It is also obvious that the development and implementation of dedicated courses on academic writing and oral scientific communication require not only funds but also human resources. The latter becomes an especially troubling issue in the context of massification of higher education in general and doctoral programs in particular, faculty often feeling overloaded and unable to assume any extra workload.

> "Increasing student workload requires attracting additional teaching workforce. <..> But where would it come from? <...> Can you imagine allocating those hours among all the teaching staff? And where do we get money to pay those teachers?" (*head of department of doctoral studies*)

The practices described above are not a cure-all remedy that will positively solve all the systemic problems of doctoral programs in institutional and learning environments of any type. First of all, the problems and directions for solving them are subject to debate. The most disputable practices include, for example, that of a university hiring its own doctoral students. With all the potential benefits mentioned above, this practice has negative effects, too. Probable employment with the same university after graduation may generate some typical problems of academic inbreeding, increasing academic isolation, inhibiting innovation, and undermining research productivity [Sivak, Yudkevich 2009; Yudkevich, Gorelova 2015]. It also matters to which positions doctoral students are hired and how their work is matched to their thesis. A survey conducted across the leading Russian universities shows that about 25% of doctoral students employed on campus are busy doing administrative work, and only half of those doing research and/or teaching reported their job duties being matched to their thesis research [Gruzdev, Terentev 2017]. About 40% of the doctoral students employed on campus complained about work impeding their learning progress [Ibid.:94].

Another debatable issue is the need to separate/combine the teaching and research tracks in doctoral programs [Shestak, Shestak 2015; Senashenko 2017]. To solve it, the goals of doctoral education should be defined. No agreement on this point has been reached in academia or among immediate participants of the doctoral education system—administrators, supervisors, and candidates. The abovementioned popular opinion that the two tracks should be separated because candidates usually pursue either teaching or research goals is counterbalanced by the results of a cross-university survey of doctoral students [Bekova et al. 2017], where an essential proportion of the respondents regarded doctoral education as a tool to boost career prospects in both domains.

As for the diversification of the candidate selection system, even if the risk of recruiting candidates with nonacademic motivations and random people who are not committed to learning or building an academic career cannot be eliminated by introducing additional admission requirements (e. g. portfolio), it can still be reduced. At the same time, additional requirements may worsen inequality in admission for applicants with different backgrounds. For instance, graduates from regional universities with less advanced research and conference infrastructures will find themselves disadvantaged at the very start. Besides, making portfolio a selection criterion may result in using it to

promote favored candidates, graduates of the same university in the first place. Regardless of some positive effects, this practice may have negative consequences, similar to those discussed in relation to academic inbreeding in a broader sense [Sivak, Yudkevich 2009; Yudkevich, Gorelova 2015].

Finally, introducing the practice of allowing students to select a supervisor prior to applying may also be fraught with some difficulties. First of all, students do not actually always have a choice. For instance, an applicant might want to explore a narrow research question, for which very few or even only one supervisor is available. Or, an applicant might need specific equipment to do their research, which only one professor or research team can provide. In cases like those, acquaintance prior to application may only be of benefit to potential supervisors who will decide whether to agree to work with a student or not. Moreover, meeting and selecting the supervisor prior to application is not even always possible. Not infrequently, an applicant will be uncertain about their research interests or willing to change their field for a doctoral degree but still unsure which topic to pick. In that case, a more effective strategy would be to provide an "orientation period" for doctoral students, during which they could elaborate on the topic of their future thesis, get to know faculty members doing research in that field, and choose an appropriate supervisor. Available findings indicate that changing fields before applying to a doctoral program is a popular trend, 21% of candidates changing their field for a related one and 6% for something totally unrelated [Bekova et al. 2017].

As we can see, the best practices that we have identified are not universal, and decisions on using them must be considered well in each specific situation. University surveys analyzing the composition of doctoral applicants (including their academic backgrounds, motivations, learning and career expectations), candidates (including doctoral program quality, supervision quality, thesis progress, etc.), supervisors, and lecturers could make an important tool for designing a reasonable doctoral program enhancement policy. Results of such surveys will allow detecting tender spots in the existing practices and devising the most effective ways of firming them.

5. Comparing Doctoral Program Enhancement Practices of Russian Universities with Those Used Abroad

The interviews with university administrators and doctoral students show that some of the practices used by foreign universities have also found application in Russian academia. Such globally implemented practices include doctoral mobility scholarships and grants which enable candidates to do academic networking within their field of research and use new connections to boost their professional development and thesis progress. The practices of encouraging communication with peers and faculty in doctoral programs within departments implemented by Russian universities are considered effective in international literature as well. The analysis performed does not allow iden-

tifying the distinctive features of such practices in Russia vs abroad or their incidence or effectiveness as a function of the national context. However, this study describes what Russian universities have been doing to overcome academic and social isolation of doctoral students. Given that those practices are perceived by the respondents (students as well as doctoral program administrators) as useful for candidates, it appears viable to disseminate them to the whole system of doctoral education in Russia.

In terms of financial support, similar trends are also observed between the doctoral program enhancement practices used in Russia and abroad. Due to the lack of empirical data on research productivity of Russian doctoral students receiving financial support, no definitive conclusion can be made yet on whether this practice is useful. However, the supporting evidence accumulated by universities in other countries [Ehrenberg, Mavros 1992; Valero 2001; Mendoza, Villarreal, Gunderson 2014; Zhou, Okahana 2016] indicates that the practice is worth disseminating among Russian universities.

As for research skill development in doctoral programs, Russian universities have adopted the international experience of providing specialized courses [McCallin, Nayar 2012] to teach research skills and competencies required for a successful academic career.

Fewer common features are observed in doctoral admissions, curriculum development, and supervision enhancement practices. It is our opinion that the potential for development in these domains remains underutilized. Russia's current laws impose constraints on universities' admission and curriculum policies, granting them very little autonomy for modifying their selection criteria, while no legal restrictions exist for supervision enhancement practices. An exception to this rule applies in the case of universities entitled to award doctoral degrees of their own. They have been using actively some of the best practices described here, in particular those concerning admissions and doctoral program development and implementation, since 2017, when they were granted the right to establish their own "rules of the game". Yet, it is too early to talk about the effectiveness of implementing those practices in Russian universities, as the first cohort of candidates enrolled after adopting the new rules will only graduate in 2020–2021. Meanwhile, the institutions that do not enjoy the privilege of establishing their own admission, learning and evaluation standards can also benefit from the ideas proposed in this article. Exchange of experience in implementing doctoral education enhancement practices at a national and cross-national level will improve thesis and degree completion rates, which may have positive effects on the scientific, economic and technology development in Russia. Such exchange could be intensified through dedicated seminars, conferences, and practical sessions for doctoral program administrators, provided that universities are transparent regarding their best practices as well as newly adopted practices and doctoral program reforms.

References

Aitchison C. (2009) Writing Groups for Doctoral Education. *Studies in Higher Education*, vol. 34, no 8, pp. 905–916.

Ampaw F. D., Jaeger A. J. (2012) Completing the Three Stages of Doctoral Education: An Event History Analysis. *Research in Higher Education*, vol. 53, no 6, pp. 640–660.

Ali A., Kohun F., Levy Y. (2007) Dealing with Social Isolation to Minimize Doctoral Attrition-A Four Stage Framework. *International Journal of Doctoral Studies*, vol. 2, no 1, pp. 33–49.

Ali P. A., Watson R., Dhingra K. (2016) Postgraduate Research Students' and Their Supervisors' Attitudes towards Supervision. *International Journal of Doctoral Studies*, vol. 11, pp. 227–241.

Bednyi B. (2016) K voprosu o tseli aspirantskoy podgotovki (dissertatsiya vs kvalifikatsiya) [On the Issue of the Goal of Postgraduate Training (Dissertation vs Qualification)]. *Vysshee obrazovanie v Rossii = Higher Education in Russia*, no 3, pp. 44–52.

Bednyi B. (2017) Novaya model aspirantury: pro et contra [A New Postgraduate School Model: Pro et Contra]. *Vysshee obrazovanie v Rossii = Higher Education in Russia*, no 4, pp. 5–16.

Bednyi B., Mironos A. (2008) *Podgotovka nauchnykh kadrov v vysshey shkole. Sostoyanie i tendentsii razvitiya aspirantury* [Preparing Scientific Workforce in Higher Education: Current Situation and Development Trends], Nizhny Novgorod: Lobachevsky State University of Nizhny Novgorod.

Bednyi B., Mironos A., Balabanov S. (2007) Faktory effektivnosti I kachestva podgotovki nauchnykh kadrov v aspiranture (sotsiologicheskiy analiz) [Factors of Efficiency and Quality of Training in Ph.D Programs (Sociological Analysis)]. *University Management: Practice and Analysis*, no 5, pp. 56–65.

Bednyi B., Rybakov N., Sapunov M. (2017) Rossiyskaya aspirantura v obrazovatelnom pole: mezhdistsiplinarny diskurs [Doctoral Education in Russia in the Educational Field: An Interdisciplinary Discourse]. *Sotsiologicheskie issledovaniya = Sociological Studies,* no 9, pp. 125–134.

Bekova S., Gruzdev I., Dzhafarova Z., Maloshonok N., Terentev E. (2017) Portret sovremennogo rossiyskogo aspiranta [The Portrait of a Modern Russian Graduate Student]. *Modern Analytics of Education*, iss. 7(15), Moscow: National Research University Higher School of Economics.

Blume-Kohout M.E., Adhikari D. (2016) Training the Scientific Workforce: Does Funding Mechanism Matter? *Research Policy*, vol. 45, no 6, pp. 1291–1303.

Bonilla J., Pickron C., Tatum T. (1994) Peer Mentoring among Graduate Students of Color: Expanding the Mentoring Relationship. *New Directions for Teaching and Learning*, vol. 1994, no 57, pp. 101–113.

Boud D., Tennant M. (2006) Putting Doctoral Education to Work: Challenges to Academic Practice. *Higher Education Research & Development*, vol. 25, no 3, pp. 293–306.

Bowen W. G., Rudenstine N. L. (1992) *In Pursuit of the Ph.* D. Princeton, NJ: Princeton University.

Brush C. G., Duhaime I. M., Gartner W. B., Stewart A., Katz J. A., Hitt M. A., ... Venkataraman S. (2003) Doctoral Education in the Field of Entrepreneurship. *Journal of Management*, vol. 29, no 3, pp. 309–331.

Cornér S., Löfström E., Pyhältö K. (2017) The Relationship between Doctoral students' Perceptions of Supervision and Burnout. *International Journal of Doctoral Studies*, vol. 12, pp. 91–106.

Di Pierro M. (2007) Excellence in Doctoral Education: Defining Best Practices, *College Student Journal*, vol. 41, no 2, pp. 368–376.

Di Pierro M. (2012) Strategies for Doctoral Student Retention: Taking the Roads Less Traveled. *The Journal for Quality and Participation*, vol. 35, no 3, pp. 29–32.

Dorn S. M., Papalewis R., Brown R. (1995) Educators Earning Their Doctorates: Doctoral Student Perceptions Regarding Cohesiveness and Persistence. *Education*, vol. 116, no 2, pp. 305–310.

Edwards B. (2002) *Postgraduate Supervision: Is Having a PhD Enough?* Paper Presented at the Australian Association for Research in Education Conference (Brisbane, 2002, December 1–5).

Ehrenberg R. G., Mavros P. G. (1992) *Do Doctoral Students' Financial Support Patterns Affect Their Times-to-Degree and Completion Probabilities*. National Bureau of Economic Research Working Paper No w4070.

Fillery-Travis A., Robinson L. (2018) Making the Familiar Strange–a Research Pedagogy for Practice. *Studies in Higher Education*, vol. 43, no 5, pp. 841–853.

Gaff J. G. (2002) Preparing Future Faculty and Doctoral Education. *Change: The Magazine of Higher Learning*, vol. 34, no 6, pp. 63–66.

Gillingham L., Seneca J. J., Taussig M. K. (1991) The Determinants of Progress to the Doctoral Degree. *Research in Higher Education*, vol. 32, no 4, pp. 449–468.

Gilbert R., Balatti J., Turner P., Whitehouse H. (2004) The Generic Skills Debate in Research Higher Degrees. *Higher Education Research & Development*, vol. 23, no 3, pp. 375–388.

Girves J. E., Wemmerus V. (1988) Developing Models of Graduate Student Degree Progress. *The Journal of Higher Education*, vol. 59, no 2, pp. 163–189.

Grant K., Hackney R., Edgar D. (2014) Postgraduate Research Supervision: An 'Agreed' Conceptual View of Good Practice through Derived Metaphors. *International Journal of Doctoral Studies*, vol. 9, pp. 43–60.

Griffiths D. A., Inman M., Rojas H., Williams K. (2018) Transitioning Student Identity and Sense of Place: Future Possibilities for Assessment and Development of Student Employability Skills. *Studies in Higher Education*, vol. 43, no 5, pp. 891–913.

Gruzdev I., Terentev E. (2017) Dannye protiv mifov: rezultaty sotsiologicheskogo issledovaniya aspirantov vedushchikh vuzov [Data Against Myths: Evidence from the Survey of PhD Students in Leading Russian Universities]. *Vysshee obrazovanie v Rossii = Higher Education in Russia*, no 7, pp. 89–97.

Halse C. (2007) Is the Doctorate in Crisis? *Nagoya Journal of Higher Education*, vol. 7, pp. 321–337.

Holley K. A., Caldwell M. L. (2012) The Challenges of Designing and Implementing a Doctoral Student Mentoring Program. *Innovative Higher Education*, vol. 37, no 3, pp. 243–253.

Ives G., Rowley G. (2005) Supervisor Selection or Allocation and Continuity of Supervision: Ph. D. Students' Progress and Outcomes. *Studies in Higher Education*, vol. 30, no 5, pp. 535–555.

Kamler B., Thomson P. (2006) *Helping Doctoral Students Write: Pedagogies for Supervision*. London: Routledge.

Kram K. E. (1985) *Mentoring at Work: Developmental Relationships in Organizational Life*. Glenville, IL: Scott, Foresman and Co.

Kuncel N. R., Hezlett S. A., Ones D. S. (2001) A Comprehensive Meta-Analysis of the Predictive Validity of the Graduate Record Examinations: Implications for Graduate Student Selection and Performance. *Psychological Bulletin*, vol. 127, no 1, pp. 162–181.

Lee A. (2018) How Can We Develop Supervisors for the Modern Doctorate? *Studies in Higher Education*, vol. 43, no 5, pp. 878–890.

Lee A., Brennan M., Green B. (2009) Reimagining Doctoral Education: Professional Doctorates and Beyond. *Higher Education Research & Development*, vol. 28, no 3, pp. 275–287.

Lindsay S. (2015) What Works for Doctoral Students in Completing Their Thesis? *Teaching in Higher Education*, vol. 20, no 2, pp. 183–196.

Lipschutz S. S. (1993) Enhancing Success in Doctoral Education: From Policy to Practice. *New Directions for Institutional Research*, vol. 1993, no 80, pp. 69–80.

Louis K. S., Holdsworth J. M., Anderson M. S., Campbell E. G. (2007) Becoming a Scientist: The Effects of Work-Group Size and Organizational Climate. *The Journal of Higher Education*, vol. 78, no 3, pp. 311–336.

Lyons W., Scroggins D. (1990) The Mentor in Graduate Education. *Studies in Higher Education*, vol. 15, no 3, pp. 277–286.

Maguire K., Prodi E., Gibbs P. (2018) Minding the Gap in Doctoral Supervision for a Contemporary World: A Case from Italy. *Studies in Higher Education*, vol. 43, no 5, pp. 867–877.

Maher M. S., Ford M. E., Thompson C. M. (2004) Degree Progress of Women Doctoral Students: Factors that Constrain, Facilitate, and Differentiate. *Review of Higher Education*, vol. 27, no 3, pp. 385–408.

Mainhard T., van Der Rijst R., van Tartwijk J., Wubbels T. (2009) A Model for the Supervisor–Doctoral Student Relationship. *Higher Education*, vol. 58, no 3, pp. 359–373.

Maloshonok N., Terentev E. (2019) National Barriers to the Completion of Doctoral Programs at Russian Universities. *Higher Education*, vol. 77, iss. 2, pp. 195–211.

Malfroy J. (2005) Doctoral Supervision, Workplace Research and Changing Pedagogic Practices. *Higher Education Research & Development*, vol. 24, no 2, pp. 165–178.

Marginson S. (2004) National and Global Competition in Nigher Education. *The Australian Educational Researcher*, vol. 31, no 2, pp. 1–28.

Marsh H. W., Rowe K. J., Martin A. (2002) PhD Students' Evaluations of Research Supervision: Issues, Complexities, and Challenges in a Nationwide Australian Experiment in Benchmarking Universities. *The Journal of Higher Education*, vol. 73, no 3, pp. 313–348.

Martinsuo M., Turkulainen V. (2011) Personal Commitment, Support and Progress in Doctoral Studies. *Studies in Higher Education*, vol. 36, no 1, pp. 103–120.

McCallin A., Nayar S. (2012) Postgraduate Research Supervision: A Critical Review of Current Practice. *Teaching in Higher Education*, vol. 17, no 1, pp. 63–74.

McCulloch A., Loeser C. (2016) Does Research Degree Supervisor Training Work? The Impact of a Professional Development Induction Workshop on Supervision Practice. *Higher Education Research & Development*, vol. 35, no 5, pp. 968–982.

MacNeil A.J., Prater D. L., Busch S. (2009) The Effects of School Culture and Climate on Student Achievement. *International Journal of Leadership in Education*, vol. 12, no 1, pp. 73–84.

Mendoza P., Villarreal P., Gunderson A. (2014) Within-Year Retention among Ph. D. Students: The Effect of Debt, Assistantships, and Fellowships. *Research in Higher Education*, vol. 55, no 7, pp. 650–685.

Mironos A., Bednyi B. (2016) K voprosu o gosudarstvennoy itogovoy attestatsii v aspiranture novogo tipa [On the Issue of Final State Certification in the Postgraduate School of a New Type]. *University Management: Practice and Analysis*, no 3, pp. 118–128.

Moneta-Koehler L., Brown A. M., Petrie K. A., Evans B. J., Chalkley R. (2017) The Limitations of the GRE in Predicting Success in Biomedical Graduate School. *PloS one*, vol. 12, no 1, e0166742.

Nerad M. (2006) Globalization and Its Impact on Research Education: Trends and Emerging Best Practices for the Doctorate of the Future. *Quality in Postgraduate Research: Knowledge Creation in Testing Times* (eds M. Kiley, G. Mullins), Canberra: The Center for Education Development and Academic Methods, pp. 5–12.

Nerad M. (2010) Increase in PhD Production and Reform of Doctoral Education Worldwide. *Higher Education Forum*, no 7, pp. 69–84.

Nerad M., Evans B. (eds) (2014) *Globalization and Its Impacts on the Quality of PhD Education: Forces and Forms in Doctoral Education Worldwide*. Rotterdam: Sense.

Nerad M., Heggelund M. (eds) (2011) *Toward a Global PhD? Forces and Forms in Doctoral Education Worldwide*. Seattle: University of Washington.

Nerad M., Miller D. S. (1996) Increasing Student Retention in Graduate and Professional Programs. *New Directions for Institutional Research*, no 92, pp. 61–76.

Noonan M. J., Ballinger R., Black R. (2007) Peer and Faculty Mentoring in Doctoral Education: Definitions, Experiences, and Expectations // *International Journal of Teaching and Learning in Higher Education*, vol. 19, no 3, pp. 251–262.

Nordentoft H. M., Thomsen R., Wichmann-Hansen G. (2013) Collective Academic Supervision: A Model for Participation and Learning in Higher Education. *Higher Education*, vol. 65, no 5, pp. 581–593.

Olmos-López P., Sunderland J. (2017) Doctoral Supervisors' and Supervisees' Responses to Co-Supervision. *Journal of Further and Higher Education*, vol. 41, no 6, pp. 727–740.

Olssen M., Peters M. A. (2005) Neoliberalism, Higher Education and the Knowledge Economy: From the Free Market to Knowledge Capitalism. *Journal of Education Policy*, vol. 20, no 3. P. 313–345.

Orellana M. L., Darder A., Pérez A., Salinas J. (2016) Improving Doctoral Success by Matching PhD Students with Supervisors. *International Journal of Doctoral Studies*, vol. 11, pp. 87–103.

Oseguera L., Rhee B. S. (2009) The Influence of Institutional Retention Climates on Student Persistence to Degree Completion: A Multilevel Approach. *Research in Higher Education*, vol. 50, no 6, pp. 546–569.

Paglis L. L., Green S. G., Bauer T. N. (2006) Does Advisor Mentoring Add Value? A Longitudinal Study of Mentoring and Doctoral Student Outcomes. *Research in Higher Education*, vol. 47, no 4, pp. 451–476.

Park C. (2007) *Redefining the Doctorate.* Discussion Paper of the Higher Education Academy https://www.lancaster.ac.uk/staff/gyaccp/RedefiningTheDoctorate.pdf

Pearson M. (2005) Framing Research on Doctoral Education in Australia in a Global Context. *Higher Education Research & Development*, vol. 24, no 2, pp. 119–134.

Pearson M., Brew A. (2002) Research Training and Supervision Development. *Studies in Higher Education*, vol. 27, no 2, pp. 135–150.

Pearson M., Evans T., Macauley P. (2008) Growth and Diversity in Doctoral Education: Assessing the Australian Experience. *Higher Education*, vol. 55, no 3, pp. 357–372.

Pearson M., Evans T., Macauley P. (2016) The Diversity and Complexity of Settings and Arrangements Forming the 'Experienced Environments' for Doctoral Candidates: Some Implications for Doctoral Education. *Studies in Higher Education*, vol. 41, no 12, pp. 2110–2124.

Peña E. V., Jimenez y West I., Gokalp G., Fischer L., Gupton J. (2010) Exploring Effective Support Practices for Doctoral Students' Degree Completion. *College Student Journal*, vol. 45, no 2, pp. 310–323.

Rose G. L. (2005) Group Differences in Graduate Students' Concepts of the Ideal Mentor. *Research in Higher Education*, vol. 46, no 1, pp. 53–80.

Senashenko V. (2017) Aspirantura kak obrazovatelnaya programma s nauchno-issledovatelskoy komponentoy ili nauchno-issledovatelskaya programma s obrazovatelnoy komponentoy? [Post-Graduate Study as Educational Program with Scientific Research Compo-nent or Scientific Research Program with Educational Component?] *Vestnik Vysshey Shkoly = Higher School Herald*, no 10, pp. 4–10.

Shestak V., Shestak N. (2015) Aspirantura kak tretiy uroven vysshego obrazovaniya: diskursivnoe pole [Postgraduate Studies at the Third Level of Higher Education: Discursive Field]. *Vysshee obrazovanie v Rossii = Higher Education in Russia*, no 12, pp. 22–34.

Sivak Y., Yudkevich M. (2009) Akademicheskiy inbriding: za i protiv [Academic Inbreeding: Pro and Contra]. *Voprosy obrazovaniya / Educational Studies Moscow*, no 1, pp. 170–187. DOI: 10.17323/1814–9545–2009–1–170–187

Taylor R. T., Vitale T., Tapoler C., Whaley K. (2018) Desirable Qualities of Modern Doctorate Advisors in the USA: A View through the Lenses of Candidates, Graduates, and Academic Advisors. *Studies in Higher Education*, vol. 43, no 5, pp. 854–866.

Terrell M. C., Wright D. J. (eds) (1988) *From Survival to Success: Promoting Minority Student Retention.* NASPA Monograph Series, No 9. Washington, D.C.: National Association of Student Personnel Administrators.

Tinto V. (1993) *Leaving College: Rethinking the Causes and Cures of Student Attrition*. Chicago: University of Chicago.

Umbach P.D., Porter S. R. (2002) How Do Academic Departments Impact Student Satisfaction? Understanding the Contextual Effects of Departments. *Research in Higher Education*, vol. 43, no 2, pp. 209–234.

Valero de Y.F. (2001) Departmental Factors Affecting Time-to-Degree and Completion Rates of Doctoral Students at One Land-Grant Research Institution. *The Journal of Higher Education*, vol. 72, no 3, pp. 341–367.

Vilkinas T. (2002) The PhD Process: The Supervisor as Manager. *Education+ Training*, vol. 44, no 3, pp. 129–137.

Wunsch M. A. (1994) Developing Mentoring Programs: Major Themes and Issues. *New Directions for Teaching and Learning*, vol. 1994, no 57, pp. 27–34.

Yudkevich M., Gorelova O. (2015) Akademicheskiy inbriding: prichiny i posledstviya [Academic Inbreeding: Causes and Consequences]. *University Management: Practice and Analysis*, no 1, pp. 73–83.

Zachary L. J. (2000) *The Mentor's Guide: Facilitating Effective Learning Relationships*. San Francisco: Jossey-Bass.

Zepke N. (2015) What Future for Student Engagement in Neo-Liberal Times? *Higher Education*, vol. 69, no 4, pp. 693–704.

Zhou E., Okahana H. (2016) The Role of Department Supports on Doctoral Completion and Time-to-Degree. *Journal of College Student Retention: Research, Theory & Practice*, vol. 20, no 4, pp. 511–529.

The Concept of Skills Mismatch and the Problem of Measuring Cognitive Skills Mismatch in Cross-National Studies

Maltseva V.

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Vera Maltseva
Candidate of Sciences in Economics, Associate Professor, Department of World Economy, Ural State University of Economics. Address: 62 Vosmogo Marta St, 620144 Ekaterinburg, Russian Federation. Email: maltsevava@gmail.com

Abstract. Skills mismatch implies discrepancy between the skills of job candidates or employed workers and job requirements. Types of mismatch are identified based on three criteria: quality of mismatch (surplus vs. shortage), reporting party (employer vs. worker/candidate), and type of skills (cognitive vs. technical). Differences in types of skills mismatch account for considerable variation in qualitative interpretation and quantitative measurement. The problem of skills mismatch has been widely debated across the OECD countries, yet it remains understudied in Russian research literature. The issue raises concerns among education and labor market researchers as well as practitioners, so this article analyzes the available findings from the prospective of their potential use by educational institutions being the key consumers of data on skills mismatch and the ones that should tackle the problem.
Five types of skills mismatch are identified, along with the specific challenges of measurement and interpretation. The article describes three methods of skills mismatch measurement to be selected as a function of which type of skills supply and demand data is used: indirect, objective direct, and subjective direct measurement. It also classifies methods of measuring the cognitive skills gap in the major cross-national studies: PIAAC, STEP, and OECD Skills for Jobs Database. It transpires that cross-national comparisons of cognitive skills mismatch mostly have to use a mixed approach due to limitations typical of cross-country research, such as the lack of objective data on skills demand and relying on subjective or indirect data alone. For this reason, the results of most cross-national skills mismatch assessments cannot be implemented by educational institutions.
Keywords: cognitive skills, skills mismatch, education, labor market, employer's requirements, cross-national comparisons.

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It was in the 2000s-2010s that researchers began to focus on the development of skills, especially cognitive ones. A proven predictor of professional success [Hanushek et al. 2015; Pellizzari, Fichen 2013], cognitive skills are one of the most important prerequisites for build-

ing a successful career trajectory at a time when the global labor market is undergoing radical transformations and the days of staying in one job, or with one company, for decades are waning [World Bank 2019]. In this context, the problem of skills mismatch has become one of the most hot-button issues at both national and international levels.

The earliest studies on skills mismatch date back to the 1970s-1980s, when levels of workers' educational attainment skyrocketed in high-income countries. The pioneering work of Richard B. Freeman [Freeman 1976] introduced the concept of overeducation in the scientific discourse, setting the stage for ample research into the problem of gaps between manpower qualifications and labor market requirements. Further on, the problem of skills mismatch (in the form of overeducation for the most part) began to be approached from the perspective of its influence on the labor market [Allen, van der Velden 2001; Sicherman 1991; Bauer 2002] and human capital development [Mendes de Oliveria, Santos, Kiker 2000]. It has been proved, by the example of overeducaiton, that skills mismatch is associated with tremendous costs at both macro- and microeconomic levels, affecting negatively aggregate labor productivity and technological progress as well as employee earnings and job satisfaction [McGowan, Andrews 2015; McGuiness, Pouliakas, Redmond 2017].

Initially, the problem of skills mismatch was approached as an imbalance between aggregate supply and demand, a problem of matching jobs with qualifications (i. e. education) [Jovanovic 1979, Sattinger 1993]. It was only in the late 2000s and particularly in the 2010s that a micro notion of skills mismatch came to be distinguished, defining the phenomenon as discrepancy between the skills possessed by a worker and those required to perform a job—at the level of each single worker-job pair [Pellizzari, Fichen 2017:3]. The issue made it to the academic and political agenda following a series of business surveys that revealed low employer satisfaction with worker skills, this shortage of human capital being ranked among the top impediments hindering business growth[1]. At the same time, the first results of international surveys of cognitive skills, including the ones involving adults (PIAAC), made it possible to measure specific-skill mismatches.

In the 1920s, the focus of research shifted to empirical measurement of the gap between the specific skills possessed by workers and those required by employers [OECD2013b; Perry, Wiederhold, Ackermann-Piek 2014; OECD2015; McGuinness, Pouliakas, Redmond 2017]. As a result, the problem of skill shortage was unveiled and brought into the spotlight. Remarkably, the shortage of cognitive skills has been associated more often with the quality of formal edu-

[1] This provoked a fierce debate over the problem of skill gaps in the sociopolitical arena. While some believe the concerns are overblown (e. g. [Krugman 2014; Weaver 2017]), others have no doubts that the skill gap is real [Bessen 2014].

cation, while that of technical skills might be a product of poor candidate awareness and recruitment mistakes [OECD2013b]. For instance, colleges are often blamed for offering programs focused on technical skills and paying little attention to generic competencies [ACT 2011; World Bank 2015].

There are two prominent talking points in the plot-twisting debate on skills mismatch. First, mismatch can take various forms, which entails a considerable variation in qualitative interpretations and quantitative measurements. Second, there is no agreement among researchers or practitioners on how the discrepancy between skills supply and demand should be measured, so no unequivocal mismatch measurements exist so far. As a result, the purely academic problem of choosing the optimal methodology for measuring skills mismatch spirals into a real-life concern for educational institutions as consumers of skills mismatch data and the ones that seek to reduce the gap. In other words, how treatment can be started if there is no exact diagnosis?

This article attempts to answer the following questions:

1. What are the forms that skills mismatch can take, and what are the measurement and interpretation challenges that arise from this diversity?
2. What are the approaches that cross-national assessments use to measure skills mismatch manifestations?
3. What are the limitations of the existing assessment methods and their outcomes? Can educational institutions implement the results of cross-national surveys of cognitive skills in practice?

The article consists of three sections. The first one examines the types of skills mismatch and describes their qualitative interpretations. The second one presents a typology of methods to assess the mismatch between workers' cognitive skills and employer requirements. The assessment methods used in PIAAC, STEP, and Skills for Jobs are compared, along with the associated limitations. The final part of the article discusses the opportunities and limitations of implementing the skills mismatch data obtained with different assessment methods.

1. The Concept and the Problem Field of Skills Mismatch

1.1. Types of skills mismatch

The term *skills mismatch* is common to find in economic literature as well as national and global strategies for labor markets and education. The generalized term implies discrepancy between the skills possessed by workers and the requirements of jobs [Handel 2003], both at the level of proficiency and the type of skill. Researchers distinguish between short-run and long-run skills mismatches (Table 1). Michael Sattinger [Sattinger 2012] defines a short-run skills mismatch as a current gap in the level or set of skills caused by candidates being imperfectly matched to vacancies, attributing such gaps to ineffective policies of labor institutions while holding the formal education sys-

Table 1. **Characteristics of Short- and Long-Run Skills Mismatches** [Sattinger 2012:6]

Characteristic	Short-run	Long-run
Causes	Low candidate awareness and recruitment mistakes	Unbalanced changes in supply and demand due to major shifts (in technology, institutional landscape, etc.)
Measures	Differences in individual job and worker characteristics	Assessments and forecasts of aggregate differences in supply and demand in the labor market
Consequences	Costly search for workers and firms, losses in worker wages, and lower firm output	Lost returns to worker investments in education and training, inadequate labor force for firm expansion and growth
Policies that address mismatches	Labor institutions to reduce search costs	Adapt educational policies to anticipated changes in the labor market

tem responsible for long-run mismatches. However, education flaws can lead to short-run mismatches as well, especially when it comes to general competencies. On the whole, both perspectives on the reasons for mismatch (imperfect recruiting decisions and low employer engagement in workforce development, on the one hand, and formal education flaws, on the other) are valid and not exclusive of each other.

The problem is pervasive and has a variety of manifestations, which often go undifferentiated under the umbrella term of *skills mismatch*. In practice, it may denote skill shortage, skill obsolescence, or field-of-study mismatch—all of which have different causes and require different measurement approaches.

Below, the major types of mismatch are analyzed. Three criteria—quality of mismatch (surplus vs. shortage), reporting party (employer vs. worker/candidate), and type of skills (cognitive vs. technical)—yield eight types of mismatch (Table 2). Three of them are not exactly skills mismatches but rather qualifications/education mismatches (shaded in grey in Table 2): overeducation, undereducation, and horizontal/field-of-study mismatch. Although education data is often used as proxy variables in assessing the level of skills, low reliability of such proxies has led to discrimination between qualifications/education mismatch and skills mismatch in the most recent studies. Results of the 2014 European Skills and Jobs Survey provide evidence that the level of education cannot be equaled to that of skills. In particular, it reveals that 19% of higher-educated workers who were found to be overeducated simultaneously lacked the skills their job needed

Table 2. **Types of Mismatch**

Surplus	Reporting party	Type of skill	Shortage	Reporting party	Type of skill
Overeducation	Worker	CS TS	Undereducation	Worker	CS TS
Overskilling	Worker	CS TS	Underskilling	Worker	CS TS
Horizontal / field-of-study mismatch	Worker	TS	Skill gap	Employer	CS TS
Skill obsolescence	Employer	TS	Skill shortage	Employer	TS

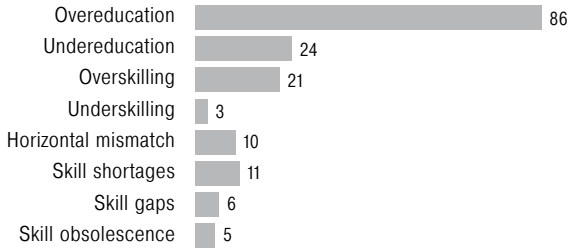
Note: CS—cognitive skills; TS—technical (job-specific) skills.
Source: Adapted from [McGuinness, Pouliakas, Redmond 2017].

when hired, which means that overeducation does not necessarily imply overskilling [Cedefop 2018a:51].

As shown in Table 2, skill shortage has a number of manifestations (underskilling, skill gap, skill shortage), which can be reported by both parties involved, employer and worker. Skill gap and underskilling are used interchangeably by a lot of researchers (e.g. [Quintini 2011]). These types of shortage are both measured by surveys, skill gap among employers, and underskilling among workers. However, empirical evidence indicates that the relationship between skill gap and underskilling measurements is not that obvious. For instance, [McGuinness, Ortiz 2016] compared data on skills mismatch within Irish firms based on a linked employer-employee survey. It turned out that employees reported skill imbalances much more often than their employers. As a result, the prevalence of underskilling was much higher than that of skill gaps. The greatest discrepancy between employers' and workers' perceptions of skills mismatch was observed for the fundamental cognitive skills of literacy and basic numeracy (agreement of only 33%). Several hypotheses have been proposed to explain this asymmetry, the central one being that employees were more biased in their perceptions as they assessed their matching to prospective requirements rather than current ones.

Skill gap and skill shortage are the key mismatches reported by employers, and it is vital to understand the difference between the two. Skill gap implies an insufficient level of proficiency in the workplace, which pushes employers to organize on-the-job training. Skill shortages create even a more severe problem, reducing job filling rates due to the lack of adequately qualified candidates. However, the negative effects of skill gaps ultimately turn out to be more extensive, as the problem is usually solved by hiring relatively suitable candidates who

Figure 1. **Number of Skills Mismatch Papers Published in 2006–2016, by Type of Mismatch**
[McGuinness, Pouliakas, Redmond 2017: 9]



Note: The review involved articles published in international peer-reviewed journals, publications of the World Bank, OECD, Cedefop, and Institute of Labor Economics. Because papers on skill gaps, skill shortages, and skill obsolescence are very few, publications published before 2006 were also included in analysis.

have to be trained in the workplace. Therefore, skill shortages can entail manifestations of skill gaps. Another difference is that skill shortage implies the lack of job-specific skills (in highly- as well as medium-qualified jobs), whereas gaps are reported by employers across all types of skills.

A review of literature on skills mismatch published since the mid-2000s shows that half of the publications address the problem of overeducation, paying far less attention to skill deficit (38% in 2006–2016; 12% only, if undereducation is left out) [McGuinness, Pouliakas, Redmond 2017] (Figure 1). Meanwhile, national policies of the world's top economies have been traditionally focused on solving the problems of skill gap and skill shortage, even though the evidence is insufficient yet to recommend this strategy.

A few hypotheses may be suggested to explain the difference in the focus of national policies and research efforts. Authorities' concerns about skill shortages are fueled by the needs of businesses that incur considerable expenses. Underskilling and skill shortages have a direct negative impact on labor productivity, affecting the size of investments in workforce training and development[2]. The reason for researchers mainly elaborating the problem of overeducation may be the high incidence of this phenomenon in the top OECD countries from which the publications originate. Indeed, population with tertiary education in the group of 25–34 year-olds exceeds 40% in 26 out of 35 OECD countries [OECD2018a].

[2] For example, 20% of establishments surveyed in Great Britain claimed that skill gaps had delayed the introduction of new products, and nearly one in three claimed that the gaps caused difficulties with the introduction of new working practices [Tether et al. 2005].

Table 3. **Cross-Classification of Workers by Personal and Job-Required Skills** [Handel 2017]

Supply (level of personal skills)	Demand (level of job-required skills)		
	Low	Medium	High
Low	1	2	3
Medium	4	5	6
High	7	8	9

(1)—low-skill match
(5)—medium-skill match
(9)—high-skill match
(2, 3, 6)—underskilling and skill gap
(4, 7, 8)—overskilling and skill gap

1.2. "Healthy" skills mismatches

Skills mismatch can take a variety of forms, but is *match* always the sought-for optimum? Skills match is measured as the degree to which the level of worker skills is matched to the one required by employer. A simplified framework for understanding the match-mismatch paradigm is proposed by Michael J. Handel [Handel 2017] (Table 3). It highlights areas of mismatch with skill surpluses and shortages as well as a few match situations for low, medium, and high levels of skills required by jobs. The low-skill match, however, is not regarded as an inherently positive situation but rather as formal absence of skills mismatch in low-skill occupations. More than that, some experts argue that the goal of perfect skills matching is a chimera and that one-shot policy measures are likely to be short-lived [Cedefop 2018a:15].

There has been much debate over the rationality of pursuing the goal of perfect skills matching and preventing skills mismatches. The prevailing opinion dictated by the demand side—employers—is that skills are largely in deficit. With graduates being underqualified, employers experience difficulties finding workers with required skills or adequate skill levels. The alarmist skills gaps narrative makes it easy to surrender to the idea of fighting the gap unconditionally and bringing the supply and demand to a perfect balance. However, a number of researchers (Table 4) consider evidence of skill gaps insufficient, as the majority of population has their skills unrecognized or underutilized—which means that the deficit, even if real, is largely determined by low incidence of workplace learning and stagnant task variety in some sectors.

Cedefop experts believe that levels of skills mismatch can change over time for individuals, and some mismatches can be considered healthy if observed when skill needs are undergoing transformation. It follows that not every formally detected skill gap is real, and that the very problem of skill shortage (reported by employers as the main re-

Table 4. **Views on the Key Skills Mismatch Problems** [Cedefop 2018a:16]

Mainstream view	Additional insights
Key problem: skill shortages Employers cannot find the right skills Graduates are ill-prepared for the skill needs of modern workplaces	Key problem: skill surpluses • The skills of a significant share of population are unrecognized or underutilized Low incidence of workplace learning in some sectors/occupations Stagnant task variety in some sectors
Skills mismatch: static Policy-makers should aim to match skill supply to skill demand	Skills mismatch: dynamic One-shot policy solutions to matching skills and jobs are short-lived Some skills mismatch can be healthy if associated with changing skill needs and continued skill formation
Skills mismatch: a cost Skill gaps are associated with lower productivity	Skills mismatch: an opportunity Some skill gaps reflect greater opportunities for continuing learning Transitions from overskilling to matched skills bring productivity gains
Lifelong learning: an individual responsibility Individuals should invest in adult training to shield against career interruptions and changing skill needs	Lifelong learning: a joint worker-firm responsibility Employer-provided training in workplaces has a greater marginal effect on workers' continuing skill development than off-the-job training

cruitment hurdle[3]) may in fact be the problem of skill surplus—unrecognition and underutilization of skills in the labor market—as well as ineffective recruitment and workforce development strategies. Finally, one-shot policy solutions to matching skills and jobs are often short-lived, so policy-makers should examine thoroughly all the possible causes and quality of the detected gaps before making any decisions to deal with mismatches.

2. Skills Mismatch Measurement in Cross-National Assessments

2.1 Approaches to measuring skills mismatch

Skill is a complex semantic construct, and its definition may vary greatly depending on the subject of research. Studies addressing skills mismatch define skill as any capability that satisfies some practical requirement of work [Handel, Valerio, Sanchez Puerta 2016:5]. That is, skills are not analyzed in isolation as some specific knowledge or personal characteristic; they should be directly relevant to job per-

[3] Genuine skill shortages are only observed in 12% of employer recruitment difficulties, while the rest can be attributed to firms' inability to offer a competitive salary or adopt a competitive recruitment strategy [Cedefop 2018a:42].

formance. Among the identified types of skills[4] (cognitive, non-cognitive/socioemotional/behavioral, and technical/job-specific), cognitive ones have been studied most extensively, largely due to the evidence of their positive macroeconomic effects and their capacity to predict professional success at the microeconomic level. General and higher-order cognitive skills are fundamental to any professional, as they are indispensable for acquiring occupation-specific skills [Ibid.:6].

Before proceeding to analysis of publications on skills mismatch measurement, it is important to emphasize the difficulty of measuring the "supply", or the level of proficiency across various skills. General cognitive skills that develop in the course of formal schooling are the easiest to measure, whereas skills that are in high demand among employers (job-specific, higher-order cognitive, and non-cognitive), acquired from informal institutions (life experience, workplaces, on-the-job training), are extremely hard to assess at the national and cross-national levels. The main reasons for that include the vast and growing variety of narrow skills required by specific jobs, which makes creating a universal measurement instrument an extremely challenging task.

Although researchers recognize unanimously the problem of skills mismatch and the important role of skills in achieving professional success, no consensus has been reached on the measurement methods so far, the major challenge being the lack of harmonized cross-country data on skills demand (skills required by employers) and supply (skills possessed by workers) with regard to a wide range of skills.

The existing approaches to measure skills mismatch represent adapted versions of the three major methods of measuring mismatches in education. There is much more literature on educational mismatch assessment methods because data on the mismatch between formal education and job requirements is more accessible and objective [Eurostat 2016]. The first assessment method is subjective self-reporting, i.e. self-assessment of matching between an individual's qualifications and the level required for successful job performance. The second one, objective measurement, is when labor market experts determine the education levels required for specific jobs or occupations and the degrees of matching those requirements. The third method is empirical and suggests that the required level of qualifications is estimated based on average levels of educational attainment within specific sectors or occupations.

We have identified three methods to assess skills mismatches based on the type of data on skills supply and demand (Table 5). The

[4] This classification is used by the World Bank [Skills Development. World Bank: http://www.worldbank.org/en/topic/skillsdevelopment]. The OECD distinguishes between cognitive, non-cognitive, and other skills, the latter including a number of varieties of narrower skills that may be classified as technical or job-specific [Skills. OECD: http://www.oecd.org/skills/].

Table 5. **Methods of Skills Mismatch Measurement**

Type of measurement	Demand for skills	Supply of skills	Mismatch measurement	Type of mismatch measured
Direct objective	Occupation profiles indicating required skill levels	Direct measurement	Comparing actual skill levels to required ones on a uniform scale	Underskilling Overskilling
Indirect	Indirect measures (employment rate, unemployment rate, overeducation rate, etc.)		Calculating a composite index of skill shortage/surplus	Skills mismatch (aggregate) Skill shortages
Direct subjective	Employer surveys		Subjective self-report of individual's skills as matched/ mismatched to current and/or prospective job requirements	Skill gaps Skill shortages Skill obsolescence
	–	Worker surveys		Underskilling Overskilling
	Linked employer-worker surveys			Skill gaps Under-/overskilling

indirect method uses indirect measures of skills supply and demand, the direct one compares the results of direct skill measurements to employer requirements, and the direct subjective one measures the gap using employer and/or worker surveys. Table 5 demonstrates that different methods may be used to assess the same type of mismatch, and combinations of methods result in mixed-methods approaches.

Let us now dwell on the examples of mismatch measures in each of the three assessment methods. Direct objective assessment measures short-run current mismatches (see Table 1) by comparing the individual level of skills to the one required for job performance. ACT WorkKeys assessments compare the proficiency levels needed for specific career clusters (e. g. "Locating Information Level 6" for "Economists") to the minimum scores achieved by examinees (e. g. Level 5 achieved). As a result, a skills mismatch (shortage, i. e. underskilling and skill gap) will be identified in this career cluster at the individual level. Aggregated skill benchmarks are created to represent the skill levels required for entry into 85% of the occupations in a given career cluster [ACT 2015].

Direct subjective assessment (surveys) also measures the short-run mismatches of "here and now" using self-report of skill gap and its size or, in case of employer surveys, expert reports. A 2014 survey of adult workers in 28 EU countries (European Skills and Jobs Survey) used six blocks of items to measure skills mismatches. In particular, the items asked participants to assess the level of skills needed to do their job on a scale of 0 to 100, the extent to which their skills were lower or higher than required to do their job on a scale of 0 to 5, and mismatches in specific skills (literacy, numeracy, ICT, etc.) on a

scale of 0 to 10 [Cedefop 2015]. With direct measurement methods, the final index of mismatch represents the share of workers who are mismatched to their jobs in one specific skill or in the whole skill set.

With indirect measurements, data on skills supply and demand is represented by indirect indicators, which make up a composite index allowing to measure aggregated mismatch or skill-specific shortages/surpluses. For example, European Skills Index is an aggregated index of 15 indicators broken down into three pillars. In particular, skills matching ranges between 0 and 100. This pillar includes two indicators of skill underutilization (long-term unemployment and underemployed part-timers) and three indicators of skills mismatch (overqualification rate among tertiary graduates, low-wage college-educated earners, and overall qualification mismatch) [Cedefop 2018b]. Section 2.2.3 presents an example of measure of skill-specific shortage.

Direct objective assessment is obviously the most reliable method of skill gap measurement, yet it is also the most difficult and costly one. One should also consider the limited range of skills that can be assessed using this method, especially on a regular basis and across countries[5]. An important advantage of direct measurements is that they identify skill gaps at the individual level, thus providing foundation for targeted measures to reduce those gaps. Subjective methods, despite being relatively easier to use, have a critical flaw of bias, which leads to essential variation and low reliability of measurements. Direct objective assessment, in addition to identifying a skill gap, may contribute to its reduction, while indirect measurements, for example, are helpful for monitoring trends in the balance of skills supply and demand. To summarize, objective and subjective assessments detect short-run mismatches, while long-run ones are measured indirectly.

2.2. Cross-national assessments of cognitive skills mismatches

2.2.1. PIAAC

Most publications and cross-country studies on skills mismatch have been based on the results of the OECD Programme for the International Assessment for Adult Competencies (PIAAC). Initially, the project did not aim to measure skill gaps; it was designed to assess general cognitive skills of adult workers, i. e. the supply of skills in the labor market. However, improving measures of skills mismatch has been made a key objective of development work for the second cycle of the survey (2018–2023) [Quintini 2017]. The first-cycle data provides both prerequisites that are necessary for assessing skills mismatch, i. e. direct objective measurement of cognitive skills offer and subjective measurement of skills demand in the form of worker surveys on skill use at work (Table 1A, Appendix). Accessibility and credibility of information on skills demand is a major challenge in cross-national assessments. The questionnaire module is based on the Job Requirement Approach (JRA), which consists in asking individuals about the

[5] For more details, see [Eurostat 2016].

Table 6. **Major approaches to measuring skills mismatch used in PIAAC-based cross-national assessments**

#	Approach	Source	Description
1	Self-report	PIAAC Background Questionnaire	Self-report on skills mismatch
2	Job Requirement Approach	Quintini (2012)	Comparing levels of skills (measured by PIAAC tests) and skill use at work (measured by self-report)
		Allen et al. (2013)	Standardized skill and skill use levels derived from [Quintini 2012]
3	Realized Match Approach	Perry, Wiederhold, Ackermann-Piek (2014)	Computing the median observed skill of workers (PIAAC results) employed in each occupation (two-digit ISCO-08) for every country
		Pellizzari, Fichen (2013)	Assigning levels of skills mismatch (based on Approach 1). For the group of well-matched (according to PIAAC tests) workers, competency bandwidths by country and occupation (one-digit ISCO-08) are derived according to average skill levels
		Pellizzari, Fichen (2017)	Assigning levels of skills mismatch (based on Approach 1). For the group of well-matched (according to PIAAC tests and self-report on skill use) workers, competency bandwidths by country and occupation (two-digit ISCO-08) are derived according to average skill levels

Source: [OECD2013a; OECD2015; OECD2018b; Quintini 2012; Perry et al. 2014; Pellizzari, Fichen 2017].

different types of tasks performed at work and the skills they use to perform them, and subsequently inferring to what extent their current skills are matched to requirements of their workplace. This approach is considered to provide a more objective description of skills than an approach relying on subjective self-assessments by individuals of the type and level of skills they possess [OECD2013b:5].

Below, methodological approaches to skills mismatch measurement are analyzed using the PIAAC data. Table 6 describes three major approaches, assigning respondents to one of the three categories—well-matched, underskilled, or overskilled.

The first method, self-report, is a direct subjective measure. The PIAAC uses this approach not only to measure the level of skill use (Table 1A, Appendix) but also to identify aggregated (non-skill-specific) mismatch in two Background Questionnaire items (Table 7). Due to low reliability of self-reported data, some researchers [Perry, Wiederhold, Ackermann-Piek 2014:148] assume that this questionnaire should not be used for measuring skills mismatch.

The second and third types of assessment represent mixed methods approaches, being based on objective data on skill levels (measured by PIAAC tests) and at the same time using subjective (self-reported) data.

Table 7. **Self-reported skills mismatch in the PIAAC Background Questionnaire**

Question 2. Do you feel that you need further training in order to cope well with your present duties?	Question 1. Do you feel that you have the skills to cope with more demanding duties than those you are required to perform in your current job?	
	Yes	No
Yes	Overskilled as well as underskilled	Underskilled
No	Overskilled	Well-matched

Source: [OECD2010; Perry, Wiederhold, Ackermann-Piek 2014:148].

Table 8. **Share of workers underskilled in numeracy (evidence from PIAAC), broken down by approach to skills mismatch measurement** (%)

	Self-report	JRA		RMA		
Country	PIAAC (BQ)	Quintini (2012)	Allen et al. (2013)	OECD (2013)	Perry Wiederhold, Ackermann-Piek (2014)	Pellizzari, Fichen (2017)
Germany	3.93 (0.46)	30.42 (0.84)	8.36 (0.60)	2.88 (0.35)	7.39 (0.76)	10.5 (0.033)
USA	2.33 (0.30)	44.71 (1.09)	9.65 (0.55)	4.54 (0.42)	7.65 (0.65)	13.9 (0.038)

Note: Standard error in parentheses. The sample consists of full-time employees between 16 and 65 years of age, excluding students and apprentices.
Source: [Perry, Wiederhold, Ackermann-Piek 2014:155, 159; Pellizzari, Fichen 2017:19]

Skills mismatch is measured by comparing proficiency levels assessed by PIAAC tests to skill use levels self-reported by PIAAC participants. Depending on how exactly this approach is used, mismatch measurement results may vary dramatically (Table 8). Although the problem of measure standardization has been solved [Allen et al. 2013], the method still has a major pitfall of being based on self-reports of PIAAC respondents, which undermines its reliability as workers tend to overstate their level of skill use [Hartog 2000].

The third method (see Table 6), Realized Match Approach, consists in deriving competency bandwidths for every country and every occupation based on PIAAC skill level tests. OECD researchers pioneered this method in 2013, but it was largely criticized for too broad occupation groupings, few career-specific observations, and using self-report data from PIAAC BQ. An alternative measure proposed in [Perry, Wiederhold, Ackermann-Piek 2014] avoids using self-reported information, thus making it possible to reach a minimum number of

observations by country-occupation of 30 and use the more detailed two-digit ISCO-08 categorization.

This approach was later upgraded [Pellizzari, Fichen 2017] by adding data from PIAAC skill use survey. Researchers computed the median observed skill of workers employed in each occupation and then defined minimum and maximum requirements in each occupation in an attempt to overcome the fundamental problem of all cross-national skills mismatch assessments, specifically the absence of direct objective or at least harmonized measures of skills demand. The authors admit that this new methodology still uses self-reported information by the workers—which is its major limitation—yet they are convinced that the potential distortions have been minimized [Ibid.:6].

Nevertheless, neither of the three PIAAC-based assessment methods analyzed above allows measuring skills mismatches by directly comparing levels of worker skills to those required for successful job performance (not those of skill use), thus placing limitations on actually using the measurement results in practice.

2.2.2. STEP Skills Measurement Program

The World Bank's STEP Skills Measurement Program provides another body of data to be used in cross-national skills mismatch assessments. Launched in 2010, the STEP was designed to measure skills mismatches in low- and middle-income countries, so it assesses both the demand for and supply of cognitive, socioemotional, and job-specific skills[6]. This is the widest-reaching cross-country study of skill gaps so far, which measures cognitive skills both objectively (PIAAC literacy test) and subjectively (self-report) and quantitatively estimates the demand for skills based on employer surveys (Table 9).

It was expected that skills mismatches would be assessed in linked household-employer surveys on skill use at work [Pierre et al. 2014:9]. However, the authors did not report the over- and underskillings estimated this way, as this approach implied using subjective information on skill use, and the available direct measures of skill-specific proficiency (literacy test results) were impossible to compare to employer survey data. Ultimately, the authors focused on measuring education mismatches, as data on education levels is more objective and reliable[7].

That is to say, skills mismatch assessments based on PIAAC data are not directly relevant to labor market needs, as skill shortages were measured using self-report data or average levels of proficiency. The STEP survey attempts to establish the relevance with labor market needs by combining direct skill measures with subjective assessments of skills demand. However, bringing this mixed methods approach to the cross-national level is challenged by the impossibility of

[6] For more details, see [Aedo et al. 2013].

[7] For more details, see [Handel, Valerio, Sánchez Puerta 2016:79–109].

Table 9. **Skills mismatch measurement in the STEP Employer Survey (for occupations Type A — Professionals)** [World Bank 2017]
Question 1: For each of the skills, indicate if there is a difference (gap) between what is required for the job and the current level of this skill in a typical worker
Question 2 (if a "Yes" was reported in Question 1): How large is the difference (gap) between the current skills and the required skills in a typical worker?

Skills	Question 1 Yes, there is a difference—1; No, there is no difference—2; This skill is not required for the job—3	Question 2 Small difference—1; Medium difference—2; Large difference—3
Can do calculations and work with numbers	1 2 3	1 2 3
Can read and write in English	1 2 3	1 2 3
Can read and write in another foreign language	1 2 3	1 2 3
Can find new and better ways to do things	1 2 3	1 2 3
Can stay on a long and difficult task until it is finished	1 2 3	1 2 3
Can be relied on to get things done	1 2 3	1 2 3
Can work well with others and listens to others' views	1 2 3	1 2 3
Can work well in very busy or difficult situations	1 2 3	1 2 3
Can continue in the face of challenging situations at work	1 2 3	1 2 3
Can easily adapt to new tasks or changes in the workplace	1 2 3	1 2 3
Can use a computer for making presentations and/or other advanced purposes like creating and managing databases, or using specialized computer programs, etc.	1 2 3	1 2 3
Can demonstrate specific technical skills relevant to the job	1 2 3	1 2 3

comparing non-standardized indicators of skills supply and demand—the current level of skills (grade or score obtained in a test) and the level required for job performance (judgmental opinion of an employer in a specific occupation and specific country, expressed during a survey)—as well as the lack of direct measures of skill levels and the impossibility of measuring directly the whole range of skills.

2.2.3. OECD Skills for Jobs Database

The OECD Skills for Jobs Database launched in 2017 is another source of cross-national data on skills mismatch[8]. This is an attempt to overcome the skills mismatch measurement pitfalls described above (subjective data, irrelevance to the labor market) and obtain the necessary cross-country information on skills that would be operational at both

[8] OECD Skills for Jobs: http://www.oecd.org/els/emp/skills-for-jobs-dataviz.htm

macro- and microeconomic levels, the latter involving individual decisions on educational trajectories and employee training and development. The database contains information on skill shortages and surpluses, education mismatches, and horizontal gaps for 35 skills (from cognitive to job-specific) disaggregated into knowledge areas from 40 OECD+ economies.

In the absence of direct objective cross-national measures of skills demand, the OECD uses a combination of indirect labor market signals. The resulting Skills Shortage Index (SSI) reveals skill-specific shortages/surpluses at the occupational level[9] in a country. The SSI is calculated in two stages.

At the first stage, the Occupational Shortage Index (OSI) is estimated, which is a composite indicator consisting of five components: hourly wage growth, total employment growth, growth in hours worked, overqualification growth, and unemployment rate. The choice of a composite index is justified as indicators within it not only complement one another but also smooth over random fluctuations in any one indicator. For instance, a combination of the former two components may have an opposite effect on demand for occupations, generating a shortage or a surplus of workers.

At the second stage, the estimated country-level OSIs are refined by calculating shortage indexes for each specific skill in every occupation. To do this, the OECD uses the US Department of Labor's Occupation Information Network (O*NET)[10,11]. O*NET represents a continuously updated database of knowledge and skills (cognitive, social, and technical) required from workers in each occupation in the US labor market. For each occupation, the O*NET database provides a matrix of skills by two dimensions, "importance" (on a scale from 1 to 5) and "level" required to perform job duties (on a scale from 0 to 7). The product of the two dimensions represents the skill-specific requirements for each occupation, which are used to compute the SSI.

The OECD Skills for Jobs Database is positively far ahead of all the other skills mismatch measurement instruments analyzed here as it uses unbiased data on skills demand; however, it is not free of limitations, either. First, skills mismatch data is derived from indirect indicators (labor market signals), and the resulting measure of skill imbalances rather describes skill needs. Second, researchers are doubtful whether it is correct to extrapolate the O*NET matrix of skills required for jobs in the US labor market to other countries [OECD2018b]. O*NET has already been applied in research on other economies[12], and the cross-country validity of O*NET scores described above has

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[9] List of occupations at the two-digit level of ISCO-08 (33 occupations in total).

[10] O*NET Resource Center: https://www.onetcenter.org/

[11] PIAAC data on skill requirements is not as detailed as those provided in O*NET and, for this reason, are not exploited in the Skills for Jobs Database.

[12] For more details, see [Aedo, Walker 2012; Aedo et al. 2013].

been formally tested by Handel [Handel 2012]. A caveat should, however, be raised about the use of O*NET to describe skills of occupations in low-income countries, as they differ significantly in terms of technology and regulatory context from the United States, which inevitably affects the skill content of certain occupations. Despite possible challenges in using the O*NET database, it remains the most comprehensive and crucial source for assessing skills in employment that exists, researchers admit [OECD2017:42].

3. Applicability of Cross-National Skills Mismatch Measurement Results and the Associated Problems

According to a survey of relevant ministries of 13 OECD countries, information obtained from skill anticipation and mismatch assessment exercises is actively used in education policies, most often in designing, updating, and revising curricula (over 90%) and providing information to students about labor market prospects (over 75%) [OECD2017:19]. Obviously, not only cross-country assessments but national surveys as well are used for those purposes, providing direct objective data that has many more chances of being applied and operationalized for decision making. The existing cross-national assessments of skills mismatch predominantly use mixed methods approaches, combining direct measurement of a narrow range of skills with subjective self-report of skill needs, this choice being dictated by the impossibility to obtain objective information on the skills demand.

In terms of potential applicability, measurements based on PIAAC and STEP data cannot be considered completely credible because of methodological limitations and flaws (Table 10). In the case of PIAAC, the major restrictions are self-reported data (including data on skill needs) and very limited implications (only two skills are measured). The prospects for using results of such assessment by educational institutions and other stakeholders are extremely limited; in fact, they are reduced to pure research. The STEP survey basically confined skills mismatch measurement to surveys (skill gaps reported by employers) and education mismatch assessment, being unable to measure skill imbalances.

The Skills Shortage Index from the OECD Skills for Jobs Database provides more reliable measures of skill shortages and surpluses. Despite the limitations (reduction to self-report on skill needs), this is the most operational database for all the stakeholders including educational institutions and students. From day one, it was designed for use by a broad public. The database is available in two modes, at OECD.Stat to be used by researchers and on a separate website with a friendly interface[13], which provides an interactive cross-country comparison of skill-specific mismatches and the “Change career” service allowing to discover which skills, abilities, and knowledge one

[13] OECD Skills for Jobs: https://www.oecdskillsforjobsdatabase.org

Table 10. **Limitations of cognitive skill measurement methods and results in cross-national assessments**

Database (developer)	Method	Type of mismatch	Measurement results	Flaws
PIAAC (OECD, since 2008)	Mixed methods (self-report + direct skill level measurement + surveys on skill use at work)	Underskilling Overskilling	Groups of underskilled, well-matched, and overskilled workers are identified for two cognitive skills in each occupation	Based on non-objective data: subjective assessment of skill needs and self-report of skill gaps; Only two skills are measured
STEP (World Bank, since 2010)	Direct subjective (employer and employee surveys) Mixed methods (direct skill level measurement + surveys on skill use at work)	Skill gaps	Groups of underskilled, well-matched, and overskilled workers are identified at the educational level; Skill gaps are identified based on employer surveys on satisfaction with worker skills	Skills mismatch measurement is reduced to qualifications mismatch measurement
OECD Skills for Jobs Database, Skills Shortage Index (OECD, since 2017)	Indirect (indicators of demand for occupations are specified using O*NET data on skill-specific requirements in each occupation)	Skill shortages	Skill Surplus/Shortage Indexes are computed for 35 skills in each occupation (at the two-digit level of ISCO-08) across 40 economies	Reduced to skill need measurement

might need to strengthen depending on their current or desired occupation in a specific country.

The characteristics of skills mismatch measurement specified in Table 10 impose severe limitations on measurement results and their interpretation. Skills mismatch data varies greatly depending on the method used, not only at the quantitative level (e. g. divergences in PIAAC data, see Table 8) but at the qualitative one as well. As a result, it is often unclear whether the problem of mismatch is actually real and, if it is, whether it is a surplus or shortage.

Let us analyze the results of skills mismatch measurement across 19 OECD countries in studies using data from PIAAC and the OECD Skills for Jobs Database. Four degrees of imbalance are used to compare the results obtained by the two methods: “shortage”, “critical shortage”, “surplus”, and “critical surplus”. For the OECD Skills Shortage Index, degrees are established as follows. The SSI takes values from 1 to –1, where positive values correspond to shortage, and negative ones, to surplus of skills. OECD experts [OECD2017:51] suggest defining critical shortage as the observations in the top quartile of the positive skill imbalance values across countries and skills, and critical surplus, accordingly, as the observations in the bottom quar-

Table 11. **Discrepancies in numeracy (mathematical) skills mismatch assessment**

Country	OECD Skills Shortage Index		Skills mismatch (assessed in [Pellizzari, Fichen, 2017] using PIAAC data)		
	Value	Shortage/ Surplus	Shortage value	Surplus value	Shortage/ Surplus
Finland	0.49	Critical shortage	0.04	0.063	Surplus
Italy	0.29	Critical shortage	0.08	0.141	Surplus
Spain	0.269	Critical shortage	0.151	0.250	Critical surplus
Denmark	0.243	Critical shortage	0.062	0.096	Surplus
Germany	0.235	Critical shortage	0.105	0.243	Critical surplus
Austria	0.183	Critical shortage	0.018	0.148	Surplus
Ireland	0.176	Critical shortage	0.121	0.153	Surplus
Czech Republic	0.17	Critical shortage	0.038	0.124	Surplus
Slovakia	0.16	Shortage	0.043	0.176	Critical surplus
Norway	0.156	Shortage	0.074	0.078	Surplus
Netherlands	0.15	Shortage	0.038	0.058	Surplus
France	0.109	Shortage	0.043	0.065	Surplus
Canada	0.098	Shortage	0.028	0.098	Surplus
USA	0.09	Shortage	0.139	0.263	Critical surplus
Sweden	0.089	Shortage	0.075	0.081	Surplus
Belgium	0.075	Shortage	0.059	0.082	Surplus
Great Britain	0.068	Shortage	0.069	0.108	Surplus
Poland	–0.007	Surplus	0.107	0.155	Surplus
Estonia	–0.03	Surplus	0.031	0.059	Surplus

Note: The OECD Skills Shortage Index for 2015; skill imbalances computed in [Pellizzari, Fichen 2017] for 2008–2013.
Source: [Pellizzari, Fichen 2017:19]; OECD.Stat. Skills for Jobs Database: https://stats.oecd.org

tile of the negative values. PIAAC-based skills mismatch measurements represent shares of well-matched and mismatched (over- or underskilled) workers. In order to distribute these results among the four degrees of imbalance, we assume that skill surplus is a prevailing problem in case the share of overskilled workers is higher than that of underskilled ones, and skill shortage prevails in the opposite case. The PIAAC first-cycle average was used as a benchmark to demarcate the critical shortage (0.087, or 8.7%) and critical surplus (0.167, or 16.7%) percentiles.

In assessing numeracy mismatch, the two methods yield divergent results in 17 out of 19 countries (Table 11). Calculations [Pellizzari, Fichen 2017] based on PIAAC data reveal skill imbalances (25.4%) in the first-cycle countries, yet surplus (16.7%) prevails over shortage (8.7%). It means that skill shortage is not a prevailing problem according to PIAAC-based computations—but the 2015 OECD Skills for Jobs Database shows a different picture of the skills imbalance, revealing skill shortages in 17 out of 19 countries, including eight cases of critical shortage.

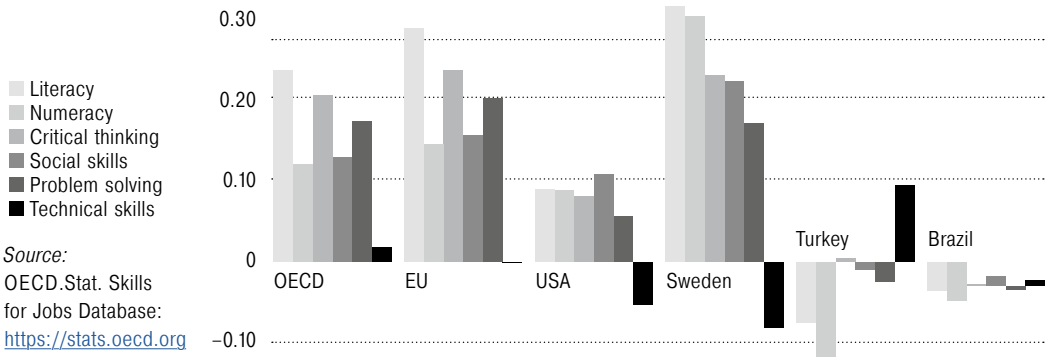
Therefore, a "head-on" comparison of skills mismatch assessments using different methods of measurement does not allow inferring the quality of the existing skill imbalance and only confirms the variation in measurements and the existence of the measurement problem. However, if measurements from both studies are analyzed separately with allowance made for the methodological characteristics, meaningful and uncontroversial inferences can be achieved.

The Skills for Jobs Database uses an indirect approach that measures a long-run skill match/mismatch. Skill shortage indexes for 35 skills in each occupation across 42 countries show that skill shortage mostly affects cognitive competencies. Nearly all OECD economies experience a shortage of cognitive skills required to perform non-routine tasks, while technical skills used for routine manual tasks are largely in surplus [OECD2017:51]. The imbalance typical of OECD countries contrasts strikingly the one discovered in low- and middle-income countries (Fig. 2). For example, Brazil and Turkey demonstrate a shortage of technical skills and a surplus in the majority of cognitive ones. Consequently, the long-run shortage of skills in the OECD countries proves the structural shift in the labor markets of high-income economies, specifically the polarization of skill needs as a result of manufacturing automation and gradual eradication of routine tasks (in a broader sense, job polarization).

PIAAC-based measurements of cognitive skills imbalances use direct objective and direct subjective approaches, thus establishing short-run mismatches. According to this type of measurement, surplus of general cognitive skills prevails over shortage, which is not in line with the long-run cognitive skills imbalance measured by the SSI. Yet, much more importantly than simply confirming again the urgency of the skill surplus problem for high-income countries, PIAAC-based assessments expose the "two-humped" shape of the mismatch distribution, i. e. nearly equal shares of overskilled and underskilled workers in a number of countries (Fig. 3). Taking into account the methodological characteristics of this skills mismatch measurement approach (use of self-report data on skill use as a proxy for skill needs/requirements), it may be suggested that the main source of both "humps" is the problem of skill underutilization, not skill level requirements.

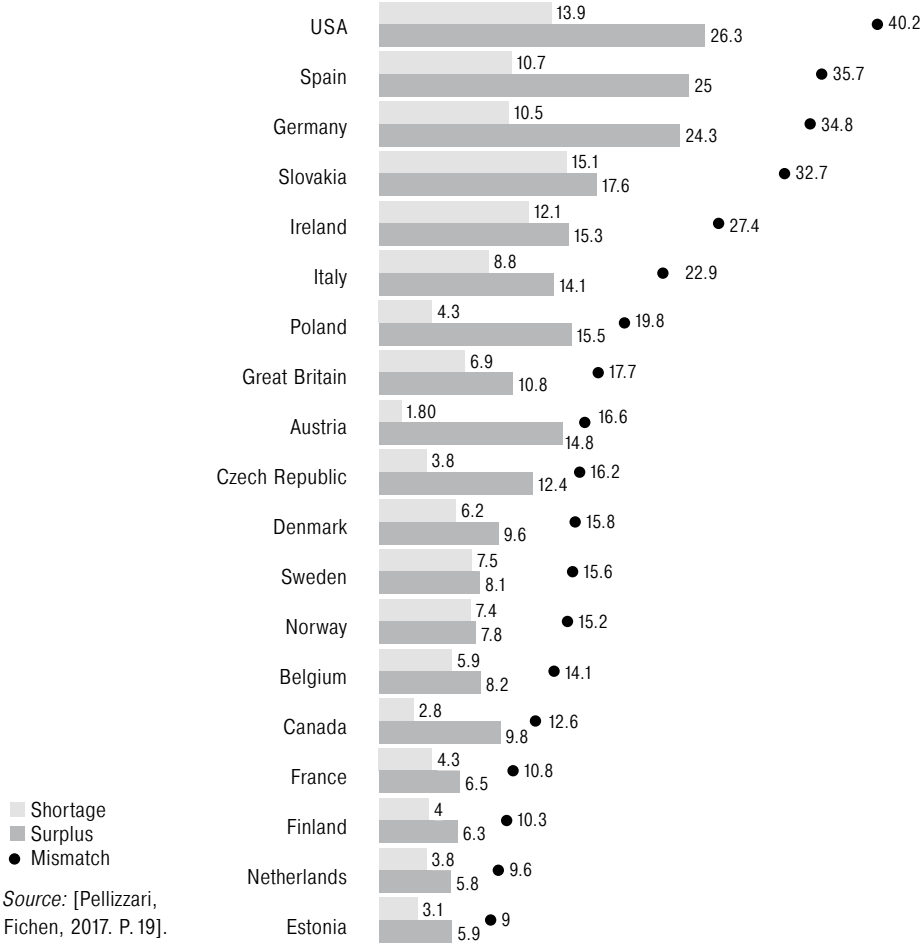
As we can see, apart from showing structural skills imbalances, cross-national data on long-run skills mismatches obtained us-

Figure 2. **Skill Shortage Index in some OECD and non-OECD countries (positive values — shortage)**



Source: OECD.Stat. Skills for Jobs Database: https://stats.oecd.org

Figure 3. **Skills mismatch by country—numeracy** (%)



Source: [Pellizzari, Fichen, 2017. P. 19].

ing indirect indicators (OECD Skills for Jobs) can be used by educational institutions as a source of information on the demand for skills across occupations and countries as well as by students and workers as guidance for choosing or changing their educational/career trajectory. On the other hand, PIAAC-based assessments measuring short-run skills mismatches are rather of interest to researchers but hardly applicable in practice, not only because they address very few skills but also because of some methodological characteristics (self-reported data on skills demand) and the associated interpretation challenges. Still, this assessment approach contributes significantly to the evolution of the debate on whether demand for skills in the labor market should be measured by job requirements or actual levels of skill use at work.

Conclusion

The international discourse on skills mismatch has been augmenting, the alarmist skill gaps narrative infiltrating more and more national agendas. While researchers and employers are debating over the size and urgency of the skills mismatch problem, political decisions are made to reduce the gap at the national level.

This article attempts to unravel the tangle of controversies and shed light on the issue of skills mismatch as a micro phenomenon at the level of specific skills and individuals. As it turns out, skills mismatch can take various forms depending on the quality of gap and the party reporting it, and zero gap is not always the sought-for result. The high dispersion of opinions regarding skill imbalances is explained by difficulties of mismatch measurement and interpretation caused by limited availability of objective data on the demand for and supply of specific skills. It is no coincidence that overeducation remains the most elaborated manifestation of skills mismatch.

The use of subjective data on skill needs and the limited number of skills tested are the main reasons why cross-country assessments cannot be relied upon. Consequently, the indexes of cognitive skills mismatch provided by the major cross-national studies (PIAAC, STEP) are not operational, being only useful for the purpose of fundamental research. However, the empirical results of those studies allow bringing to a broad public the issue of whether it is skill underutilization or formal education flaws that should be considered the root of the mismatch problem. An exception is the skills mismatch assessment based on the new OECD database, which measures long-run imbalances. Not only does this data on skill needs allow to monitor structural shifts in the skills mismatch but it can also be applied by a wide range of users, first of all educational institutions, students, and workers.

Since the OECD-based instrument is the only one of all the major cross-country studies measuring skills mismatch that can be regarded as potentially operational to be used by educational institu-

tions, colleges will have to utilize a broader array of skills mismatch data obtained at the national level in order to achieve their strategic and tactical objectives.

References

ACT (2011) *A Better Measure of Skills Gaps. Utilizing* ACT *Skill Profile and Assessment Data for Strategic Skill Research*. Available at: https://www.act.org/content/dam/act/unsecured/documents/abettermeasure.pdf (accessed 10 July 2019).

ACT (2015) *Career Readiness in the United States 2015*. Available at: https://www.act.org/content/dam/act/unsecured/documents/CareerReadinessinUS-2015.pdf (accessed 10 July 2019).

Aedo C., Hentschel J., Luque J., Moreno M. (2013) *From Occupations to Embedded Skills: A Cross-Country Comparison*. Policy Research Working Paper No WPS6560. Washington, D.C.: World Bank.

Aedo C., Walker I. (2012) *Skills for the 21st Century in Latin America and the Caribbean*. Available at: https://openknowledge.worldbank.org/handle/10986/2236 (accessed 10 July 2019).

Allen J., Levels M., van der Velden R. (2013) *Skill Mismatch and Skill Use in Developed Countries: Evidence from the PIAAC Study. ROA Research Memorandum 017*. Maastricht: Maastricht University, Research Centre for Education and the Labour Market (ROA).

Allen J., van der Velden R. (2001) Educational Mismatches Versus Skill Mismatches: Effects on Wages, Job Satisfaction and On-the-Job Search. *Oxford Economic Papers*, vol. 53, no 3, pp. 434–452.

Bauer T. (2002) Educational Mismatch and Wages: A Panel Analysis. *Economics of Education Review*, vol. 21, no 3, pp. 221–229.

Bessen J. (2014) Employers Aren't Just Whining—the "Skills Gap" Is Real. *Harvard Business Review*, August 25. Available at: https://hbr.org/2014/08/employers-arent-just-whining-the-skills-gap-is-real (accessed 10 July 2019).

Cedefop (2015) *Final Questionnaire Cedefop European Skills and Jobs Survey*. Available at: http://www.cedefop.europa.eu/files/2015–10–06_cedefop_european_skills_survey-questionnaire.pdf (accessed 10 July 2019).

Cedefop (2018a) *Insights into Skill Shortages and Skill Mismatch. Learning from Cedefop's European Skills and Jobs Survey*. Available at: https://www.cedefop.europa.eu/en/publications-and-resources/publications/3075 (accessed 10 July 2019).

Cedefop (2018b) *2018 European Skills Index Technical Report*. Available at: https://www.cedefop.europa.eu/en/publications-and-resources/publications/3080 (accessed 10 July 2019).

Eurostat (2016) *Statistical Approaches to the Measurement of Skills*. Eurostat Statistical Working Papers. Luxembourg: Publications Office of the European Union.

Freeman R. B. (1976) *The Overeducated American*. New York: Academic Press.

Handel M. (2003) Skills Mismatch in the Labour Market. *Annual Review of Sociology*, vol. 29, no 1, pp. 135–165.

Handel M. J., Valerio A., Sanchez Puerta M. L. (2016) *Accounting for Mismatch in Low- and Middle-Income Countries: Measurement, Magnitudes, and Explanations. Directions in Development.* Washington, DC: World Bank. doi: 10.1596/978–1–4648–0908–8

Handel M. J. (2012) *Trends in Job Skill Demands in OECD Countries*. OECD Social, Employment and Migration Working Papers No 143. Paris: OECD.

Handel M. J. (2017) *Education and Skills Mismatch in Developing Countries: Magnitudes, Explanations, and Impacts Results from the World Bank* STEP *Sur-*

veys. Available at: http://www.ilo.org/wcmsp5/groups/public/--ed_emp/--ifp_skills/documents/presentation/wcms_554331.pdf (accessed 10 July 2019).

Hanushek E. A., Schwerdt G., Wiederhold S., Woessmann L. (2015) Returns to Skills around the World: Evidence from PIAAC. *European Economic Review*, no 73, pp. 103–130.

Hartog J. (2000) Over-Education and Earnings: Where Are We, Where Should We Go? *Economics of Education Review*, vol. 19, no 2, pp. 131–147.

Jovanovic B. (1979) Job Matching and the Theory of Turnover. *Journal of Political Economy*, vol. 87, iss. 5, pp. 972–990.

Krugman P. (2014) Jobs and Skills and Zombies. *The New York Times*, March 30. Available at: https://www.nytimes.com/2014/03/31/opinion/krugman-jobs-and-skills-and-zombies.html?_r=1 (accessed 10 July 2019).

McGowan M.A., Andrews D. (2015) *Skill Mismatch and Public Policy in* ***OECD*** *Countries.* Economics Department Working Papers No 1210. Paris: OECD.

McGuinness S., Ortiz L. (2016) Skill Gaps in the Workplace: Measurement, Determinants and Impacts. *Industrial Relations Journal*, vol. 47, no 3, pp. 253–278.

McGuinness S., Pouliakas K., Redmond P. (2017) *How Useful Is the Concept of Skills Mismatch?* Discussion Paper Series IZA DP No 10786.

Mendes de Oliveria M., Santos M. C., Kiker B. (2000) The Role of Human Capital and Technological Change in Overeducation. *Economics of Education Review*, vol. 19, no 2, pp. 199–206.

OECD (2010) ***PIAAC*** *Background Questionnaire* MS *Version 2.1 d. d. 15–12–2010*. Available at: http://www.oecd.org/education/48442549.pdf (accessed 10 July 2019).

OECD (2013a) ***OECD*** *Skills Outlook 2013: First Results from the Survey of Adult Skills*. Paris: OECD.

OECD (2013b) *Technical Report of the Survey of Adult Skills (****PIAAC****).* Paris: OECD. Available at: https://www.oecd.org/skills/piaac/_Technical%20Report_17OCT13.pdf (accessed 10 July 2019).

OECD (2015) *Skill Mismatch and Public Policy in* ***OECD*** *Countries*. Economics Department Working Papers No 1210. ECO/WKP(2015)28. Paris: OECD.

OECD (2017) *Getting Skills Right: Skills for Jobs Indicators*. Paris: OECD.

OECD (2018a) *Population with Tertiary Education (Indicator)*. Available at: https://data.oecd.org/eduatt/population-with-tertiary-education.htm (accessed 10 July 2019).

OECD (2018b) *Skills for the 21st Century: Findings and Policy. Lessons from the* ***OECD*** *Survey of Adult Skills.* Available at: http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=EDU/WKP(2018)2&docLanguage=En (accessed 10 July 2019).

Pellizzari M., Fichen A. (2013) *A New Measure of Skills Mismatch: Theory and Evidence from the Survey of Adult Skills (*PIAAC*).* Paris: OECD.

Pellizzari M., Fichen A. (2017) A New Measure of Skill Mismatch: Theory and Evidence from PIAAC. IZA *Journal of Labor Economics*, vol. 6, no 1, pp. 1–30.

Perry A., Wiederhold S., Ackermann-Piek D. (2014) How Can Skill Mismatch Be Measured? New Approaches with PIAAC. *Methods, Data, Analyses*. Vol. 8. No 2. P. 137–174.

Pierre G., Sanchez Puerta M. L., Valerio A., Rajadel T. (2014) ***STEP*** *Skills Measurement Surveys Innovative Tools for Assessing Skills*. Washington, DC: World Bank. Available at: https://openknowledge.worldbank.org/handle/10986/19985(accessed 10 July 2019).

Quintini G. (2011) *Over-Qualified or Under-Skilled: A Review of Existing Literature*. OECD Social, Employment and Migration Working Paper No 121. Paris: OECD.

Quintini G. (2012) *The Skill Proficiency of the Labour Force and the Use of Skills in the Workplace*. Paper Presented at the 10th Meeting of the PIAAC BPC. Berlin, Germany.

Quintini G. (2017) Skills Use and Mismatch at Work: What Does PIAAC Tell Us? Proceeding of the *International Conference on Jobs and Skills Mismatch (Geneva, May 11–12, 2017)*. Available at: https://www.ilo.org/wcmsp5/groups/public/--ed_emp/--ifp_skills/documents/presentation/wcms_554335.pdf (accessed 10 July 2019).

Sattinger M (1993) Assignment Models of the Distribution of Earnings. *Journal of Economic Literature*, vol. 31, iss. 2, pp. 831–880.

Sattinger M. (2012) Qualitative Mismatches. *Foundations and Trends in Microeconomics*, vol. 8, no 1–2, pp. 1–168.

Sicherman N. (1991) Overeducation in the Labor Market. *Journal of Labor Economics*, vol. 9, no 2, pp. 101–122.

Tether B., Mina A., Consoli D., Gagliardi D. (2005) *A Literature Review on Skills and Innovation. How Does Successful Innovation Impact on the Demand for Skills and How Do Skills Drive Innovation?* A CRIC Report for the Department of Trade and Industry. Manchester: ESRC.

World Bank (2015) *Razvitie navykov dlya innovatsionnogo rosta v Rossii. Doklad № ACS1549* [Developing Skills for Innovative Growth in the Russian Federation. Report No: ACS1549], Moscow: Alex Publishers.

Weaver A. (2017) The Myth of the Skills Gaps. *MIT Technology Review*. August 25. Available at: https://www.technologyreview.com/s/608707/the-myth-of-the-skills-gap/amp/ (accessed 10 July 2019).

World Bank (2017) STEP *Skills Measurement Employer Survey 2017: Questionnaire*. Available at: http://microdata.worldbank.org/index.php/catalog/2994 (accessed 10 July 2019).

World Bank (2019) *World Development Report 2019: The Changing Nature of Work*. Washington, DC: World Bank.

Appendix

Table 1A. **PIAAC module on the use of skills at work**

Type of items	Items	Response Options
Skill Use Work—Literacy—Reading Scale G_Q01 (items G_Q01a, G_Q01b, G_Q01c, G_Q01d, G_Q01e, G_Q01f, G_Q01g, and G_Q01h)	How often (do/did) you read or use information from each of the following as part of your main job? directions or instructions letters, memos or emails articles in newspapers, magazines or newsletters reports, articles, magazines or journals books manuals or reference materials bills, invoices, bank statements or other financial statements diagrams, maps or schematics	Never Less than once a month Less than once a week but at least once a month At least once a week but not every day Every day
Skill Use Work—Literacy—Writing Scale G_Q02 (items G_Q02a, G_Q02b, G_Q02c, and G_Q02d)	How often (do/did) you write or fill out each of the following as part of your main job? letters, memos or emails articles in newspapers, magazines or newsletters reports forms	
Skill Use Work—Numeracy Scale G_Q03 (items G_Q03a, G_Q03b, G_Q03c, G_Q03d, G_Q03e, G_Q03f, G_Q03g, and G_Q03h)	In your main job, how often (do/did) you use arithmetic or mathematics to: calculate prices, costs or budgets? use or calculate fractions or percentages? use a calculator (either hand-held or computer-based)? prepare charts, graphs or tables? use simple algebra or formulas? use advanced math or statistics (complex algebra, trigonometry or regression techniques)?	
Skill Use Work—ICT—Internet and Computer Scale G_Q05 (items G_Q05a, G_Q05b, G_Q05c, G_Q05d, G_Q05e, G_Q05f, G_Q05g, and G_Q05h)	In your main job, how often (do/did) you: use email? use the Internet in order to better understand issues related to your work? conduct transactions on the Internet, for example buying or selling products or services, or banking? use spreadsheet software, for example Excel? use a word processor, for example Word? use a programming language to program or write computer code? participate in real-time discussions on the internet, for example online conferences, or chat groups?	

Source: [OECD2010; OECD2013b: 31].

Integration of Schools in Latvia and Estonia Using Curriculum Reforms

T. Khavenson

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Tatiana Khavenson
PhD in Education, Research Fellow Educational Innovations Laboratory, Institute of Education, National Research University Higher School of Economics. Address: 20 Myasnitskaya St, 101000 Moscow, Russian Federation. Email: tkhavenson@hse.ru

Abstract. This article investigates into the reform of national school curriculum in Russian-language schools in Latvia and Estonia. We assess how well the reform-related regulations have been integrated into everyday schooling practices and reflected in educational outcomes in order to measure the success of the education reform in terms of curriculum acceptance and PISA result improvements. The study exploits the situation of natural experiment that followed the collapse of the Soviet Union, with countries that used to have a common education system taking different reform paths and achieving different outcomes. National school curriculum is analyzed at three levels: as intended (stipulated in documents), as implemented (taught by school teachers), and as attained (reflected in test results). Such three-level analysis required studying the documents that described the key reform provisions, conducting a series of in-depth interviews in Russian-language schools to investigate the process of integrating the proposed innovations in teaching practices, and analyzing how PISA results in Latvia and Estonia had changed between 2006 and 2015. It is shown that the gap between the intended and attained curriculum has reduced in both countries. Schools have been actively integrating the changes proposed, and PISA results have been improving consistently, yet the methods of achieving those results differ between the countries. The natural experiment study design allowed to explore educational reform processes in the two countries as well as to assess the effects of the reforms introduced.

Keywords: school education reforms, post-socialist countries, PISA, comparative research in education, reform analysis methodology, national curriculum.

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The collapse of the Soviet Union was followed by dramatic transformations in all aspects of life in the post-Soviet and, on a broader scale, post-socialist countries whose population found it hard to accept many of the changes. In particular, challenges emerged in building new education systems. Integration of ethnic Russians became one of the major problems in former Soviet repub-

lics[1]. First of all, the status of Russians changed remarkably in the early 1990s. After the dissolution, they went all the way down from the Union-wide top of the socioeconomic ladder to ethnic minority groups, losing their linguistic, employment and other privileges [Rannut 1991; Raun 2009; Vihalemm, Hogan-Brun 2013]. Second, some of the former Soviet republics had been ethnically homogeneous before they became part of the Soviet Union—which means that they had little bilingual experience and very few strategies for establishing social institutions in a society with a large ethnic minority group [Bureau central de statistique de l'Estonie 1937]. In the Baltic countries—Latvia, Estonia, and Lithuania—linguistic and ethnic integration was a vital concern of education policy development [OECD2001a; Silova 2002a].

National school curriculum is a crucial component of such integration; it implies that every school student in a country acquires roughly the same set of knowledge and skills in uniform learning environments [Heyneman 1998; Heyneman, Catlaks, Dedze 2001; Livingstone et al. 1986; Njeng'ere 2014]. Integration of Russian-speaking minority groups into national education systems was the goal of Russian-language school reforms in general and curriculum reforms in particular. By the time the reforms were initiated, Latvian and Estonian majority-language schools had already elaborated new systems of educational values based on the constructivist approach to learning and learner-centered education and were ready to disseminate those new practices to the whole education system.

Previous research on national school curriculum demonstrates that its actual content and effects can only be assessed with a three-tier approach: what official documents prescribe and what society would like to see taught (the intended curriculum), what is actually taught in the classroom and how teachers incorporate all the curriculum components in their everyday classroom practices (the implemented curriculum), and what students have learnt (the attained curriculum). The three dimensions of curriculum can never overlap fully, the overlapping degree being an important indicator of curriculum integration in real school life [Bempechat, Jimenez, Boulay 2002; Livingstone et al. 1986; Martin 1996]. This study compares all the three manifestations to analyze the process of new curriculum im-

[1] When the Soviet Union recognized the independence of Latvia and Estonia in 1991, Russians were the largest ethnic minority group in both countries. The best part of Russian-speaking population had migrated to the Baltic states during the Soviet era. According to census bureau reports, ethnic Russians in Estonia accounted for 8% in 1934, 30% in 1989, and 26% in 2000. A similar trend is observed in Latvia with its 9% of ethnic Russians in 1935, 34% in 1989, and 30% in 2000 [Soros Foundation—Latvia 2001; Statistics Estonia 2016; Bureau central de statistique de l'Estonie 1937; Statistical Office of Estonia, Central Statistical Bureau of Latvia and Statistics Lithuania 2003].

plementation as a fundamental part of integrating Russian-language schools into the national school education systems of Latvia and Estonia. Integration is considered more or less successful if what society would like students to be taught (the intended curriculum) is approximately equal to what is actually taught in the classroom (the implemented curriculum) and what students actually learn (the attained curriculum).

The aim of this study was to determine whether integration has been achieved or at least whether the gaps among the three aspects of curriculum have reduced since the reformation of education content in Russian-language schools was initiated.

Data on the intended curriculum was obtained by examining the national curriculum regulations in both countries. Interviews with school teachers and principals provided information on the implemented curriculum. The attained curriculum was assessed using PISA results. An approach like this implies a mixed methods design, which combines qualitative and quantitative methods of data collection and analysis. Natural experiment methodology was applied to measure the effects of the new curriculum on educational outcomes.

Further on, the article scrutinizes the characteristics of education reform analysis methodology and describes the methodology and empirical basis of this study. Finally, research findings are presented and discussed using the lens of the threefold curriculum.

1. Methodology of the Three-Tier Approach to Curriculum Analysis

Since the intended, implemented, and attained curricula differ in their content, they cannot be assessed using the same method and require different analytical approaches.

The intended curriculum was analyzed using the official documents regulating the content and implementation of the new national school curriculum as part of the reform of Russian-language schools in Estonia and Latvia.

The implemented curriculum was assessed using interviews with school teachers and principals designed to measure the degree of curriculum integration and explore teachers' perceptions of the new curriculum. Because teachers and principals are mediators between the curriculum and students, they were selected to be respondents in the survey assessing the implemented curriculum. Studies show that if these key agents do not approve or accept a reform proposed, the latter will not be implemented to the extent originally planned [Erss et al. 2014; Spreen 2004; Livingstone et al.:7].

The attained curriculum was assessed by analyzing how PISA results of Latvian, Estonian, and Russian school students changed between 2006 and 2015, i. e. during the reform period.

Impossibility to measure precisely the role that specific reform interventions play in educational changes is a common problem experienced by researchers trying to assess reform effectiveness. Reforms

are introduced gradually, blurring the landscape of transformations, and the effects of reforms are hard to differentiate from those of other concurrent processes. This methodological problem is solved by the situation of natural experiment which had arisen from the historical events of the late 20th century. In the early 1990s, when the newly recognized states were building their own education systems, conditions under which initially similar groups existed began to come apart, as those groups were involved in different transformation processes. In a context like that, natural experiment provides an opportunity to compare the education systems of Latvia and Estonia to the precursor system (that of Russia).

Originally, the education systems of the three countries had very much in common, as Soviet authorities had worked hard to unify education standards across all the 15 republics—and finally achieved the goal by the end of the 1980s [Herbst, Wojciuk 2017; Mitter, 1992]. Teacher qualifications were also uniform across the three countries, a number of Latvian and Estonian teachers in Russian-language schools holding diplomas of Soviet colleges earned either in their home republic or in the Russian SFSR.

By the time the reforms were introduced—in the first half of the 2000s—the education systems of the countries analyzed had become extremely divergent, since the curricula and teaching practices of Latvia and Estonia had undergone considerable transformations, while those of Russia remained almost unchanged—in part due to the huge inertia of the national education system, in part due to lower reform intensity and lower acceptance rates among the teaching community [Borisenkov 2006; Kapuza et al. 2017].

In both Baltic countries, reformation of Russian-language schools began much later than that of majority-language schools. Some changes were introduced in ethnic majority schools as early as in the late 1980s and were in place throughout the 1990s. Meanwhile, Russian-language schools were kept in the background, maintaining their old curricula and teaching standards, and being largely disregarded and undermonitored by the educational authorities. It was not until the early 2000s in Latvia and the mid-2000s in Estonia that the reform of Russian-language schools was finally given impetus.

Comparative analysis of school students' academic achievements in Russia, Latvia and Estonia offers a rare opportunity to explore the educational outcomes (the attained curriculum) of Russian-speaking students attending schools in different countries—hence, studying in different learning contexts. Comparison of their academic achievements may help determine the role that learning environment plays in educational outcomes.

This study uses partially mixed concurrent equal status design to examine all the three manifestations of curriculum [Leech, Onwuegbuzie 2009]. This type of research design implies that quantitative and qualitative phases of research have purposes of their own, and the

combination of quantitative and qualitative findings allows conducting meta-inferences.

Document analysis was aimed at getting the idea of the new curriculum content and implementation process in Russian-language schools of Latvia and Estonia. The qualitative phase was focused on exploring the process of national school curriculum integration and acceptance in Russian-language schools of the two countries. This involved in-depth interviews with school principals and their deputies as well as classroom observations. Interviews included questions about school in general, teachers, national school curriculum and its transformations, teaching methods, approaches to student assessment and the reform-related changes in them, and participation in international student assessments, such as PISA and TIMSS. The interviewees were also asked to explain the improvement of PISA results in Russian-language schools. Classroom observations were designed to determine the teaching approaches used, identify manifestations of the new teaching practices, and measure overall classroom environment. Interviews were also conducted with Ministry of Education officials and reform designers.

The sample included seven schools in Estonia (Tallinn, Narva, and Kohtla-Järve), six in Latvia (Riga), and three in Russia (Moscow and Moscow Oblast). The schools were selected using the purposive and snowball sampling methods. One group interview and one classroom observation were conducted in each of the schools. The length of interviews varied between 90 and 120 minutes. Field studies were carried out in June and September 2013 in the Baltic states and in May–June 2013 and September 2014 in Russia.

Interview transcripts were explored using the method of thematic analysis, which consists in identifying patterns of meaning (themes) within data. Some preliminary codes were assigned to the themes outlined in the interview guides, and more codes were added in the process.

The quantitative phase involved comparing the changes in PISA results among majority-and Russian-language schools[2] in Latvia and Estonia and schools in Russia. Data from student questionnaires and PISA scores in reading, science and mathematics obtained in 2006,

[2] The language of school and home are not always the same. Estonian parents rarely send their children to Russian-language schools, and vice versa. Overall, in all the four cycles of PISA, only 4% of children speaking Russian at home attended Estonian-language schools, and 0.8% of those with Estonian as a home language attended Russian-language schools. As for Latvia, 8% of children with Russian as a home language attended Latvian-language schools, and 2% of children speaking Latvian at home attended Russian-language schools. Bearing in mind that ethnically diverse families are more than common for both countries, the study was not restricted to children speaking the same language at school and at home.

Table 1. **Sample Sizes for Each of the Five Groups Broken Down by PISA Years**

Number of students in	2006	2009	2012	2015
Russian-language schools in Latvia	1,515	1,034	1,064	1,282
Latvian-language schools in Latvia	3,177	3,457	3,230	3,567
Russian-language schools in Estonia	1,190	885	989	1,245
Estonian-language schools in Estonia	3,675	3,837	3,768	4,337
Russian schools	4,871	5,002	5,005	5,849
Total	14,428	14,215	14,056	16,280

2009, 2012, and 2015 are analyzed.[3] In both Baltic countries, PISA assessments were administered in the majority and Russian languages, Russian-language versions of questionnaires and tests being completely identical to those used in Russia. Access to this data allows not only comparing school students across the countries but also subcategories of students based on the language used in teaching. Table 1 shows the size of samples in each of the five groups broken down by years. The samples are representative for each country as well as for each language group within the countries.

PISA performance in the five groups was assessed using regression analysis, where PISA scores were a dependent variable and the type of school (based on the country and language used in teaching) was a predictor. In addition, the model featured a number of control variables, in particular socioeconomic status at the individual and group levels. Regression models were estimated for each assessment year.

$$S_{ij} = b_0 + b_1 St_i + b_2 Cnt_j + e_i,$$

where S_{ij} is standardized PISA score (in mathematics, science, or reading), St_i is socioeconomic status (mother's education, number of books in the home, average number of books among classmates),

[3] The PISA sample is representative for 15-year-old students in each of the countries. In Russia, 15-year-olds may attend a secondary or vocational school. The sample of Russian school students only included those attending secondary schools. Vocational schools excluded from analysis accounted for 14% of the sample in 2006, 5% in 2009, 4% in 2012, and 3% in 2015. The dramatic drop observed in 2009 is explained by the transition from three- to four-year programs in elementary education. As a result, beginning with 2009, 15-year-olds in Russia are normally enrolled in the 9th grade of secondary school, just as in the Baltic states. In Latvia and Estonia, less than 1% of 15-year-old students attend vocational schools.

and Cnt_j is a dummy variable for every group of schools depending on the language used in teaching.

2. Results

2.1. Education Reforms in Latvia and Estonia: The Intended Curriculum

Following the collapse of the Soviet Union, Latvia and Estonia initiated reforms of curricula, textbooks, and other instructional materials as well as teacher retraining campaigns in the majority-language schools [OECD2001a; Silova 2002b; Anweiler 1992; Mitter 1992]. In Estonia, some educational changes were introduced as early as in the late 1980s [OECD2001b]. Moreover, it was already in the 1960s and 1970s that this republic stood out with its eleven-year schooling (instead of ten-year programs), some curriculum variations in science, foreign languages, music and arts, and specialized high school curricula in nearly half of the schools.

Latvia's first education law was adopted in 1991 and revised in 1998. The new national school curriculum adopted in April 1998 placed special emphasis on knowledge application, problem-solving skills, and active learning. The regulations also stressed the role of Latvian as the language of national unity and the one to be used in teaching [Carnoy, Khavenson, Ivanova 2015; OECD2001a; Dedze, Catlaks 2001; Kangro, James 2008].

Estonia's first education law was adopted in 1992, followed by the 1998 law on secondary school education. The new national school curriculum was introduced in 1996 and revised in 2011. The teaching approaches contained in it are very similar to those in Latvia. In particular, the new Estonian curriculum advocates the idea of learning to learn, underlining the importance of fostering social competencies and encouraging initiative and entrepreneurial skills [Kitsing 2011; OECD2001b].

Curriculum reforms in Russian-language schools differed from those in the majority-language schools in both countries. In Estonia, such schools were left to themselves in the 1990s and even in the early 2000s, so no strict requirements applied to their curricula. In Latvia, the reformation of Russian-language schools started in 2000 and involved, most importantly, bilingual instruction since elementary school. The curriculum of Russian-language schools was modified to align with Latvia's national curriculum. Despite high-intensity teacher and principal retraining programs designed to meet the new standards and the broad public discussion of the bilingual education reform that preceded the introduction of the new school curriculum, the reformation process and the integration of new rules were distressing for Russian-language schools [Carnoy, Khavenson, Ivanova 2015; Dedze, Catlaks 2001; Silova 2002a; Khavenson, Carnoy 2016; Latvian Centre for Human Rights and Ethnic Studies 2004].

It was even later, in 2006–2007, that a comprehensive reform of the Russian-language school curriculum began in Estonia. Its goal was to integrate active and practice-oriented learning (not only ac-

quisition but also application of knowledge), functional reading, and other innovative teaching practices that had already been widely used by Estonian-language schools. Essential effort was applied to motivate school teachers and principals to participate in the reform process [Logvina 2014; OECD2001b]. Those changes can be regarded as the intended curriculum and at the same time as a signal to Russian-language schools in Latvia and Estonia about what children should learn.

2.2. The Schooling Process: The Implemented Curriculum

The results of interviews and observations were used to reconstruct the schooling processes, paying specific attention to the teaching methods and curriculum changes introduced by the reform.

2.2.1. The Learning Process and the Curriculum

Respondents in both Latvia and Estonia often mentioned some new practices and changes in the curriculum (Fig. 1) which emerged as a result of the reform, such as personalized learning ("*an individualized approach to every child instead of treating everyone in a uniform way*"), problem-based learning, focus on real-world connections, practical and experimental approaches and extracurricular activities in science education, knowledge application and logical reasoning tasks across the curriculum, functional reading across the curriculum (especially in Estonia), group work (projects, classroom teamwork), the use of new technologies (digital textbooks, interactive whiteboards, online resources, etc.), and the integration of PISA-based assessment instruments.

However, school teachers and principals' perceptions of such changes are divergent between Estonia and Latvia. Estonian project participants mostly give positive feedback on the new approaches to teaching and curriculum transformations, whereas Latvian principals and their deputies seem to have mixed feelings about the innovations. While recognizing the benefits of the new practices, they complain about the amount of time allocated to the integration of innovations: "*Experiments should not take up more than 20% of the school hours, but the proportion has already risen to 60%*". Still, they admit that students are more willing to engage in the learning process when classroom activities are organized using the new approaches.

The respondents in both countries feel positively about personalized learning as an educational trajectory as well as an everyday classroom practice. Judged by the interview data, teachers in both Estonia and Latvia devote very much attention to individual achievements of every child in a variety of disciplines, being prepared to deliver knowledge at different levels and evaluate performance within individual student progress profiles. Teachers' responses to interview questions often included such explanations as, "*It is a common practice when you divide the board in three—for three different groups*" or, "*Students take the same test but they may complete a different number of items.*" A unified approach to all students in the classroom is as-

Figure **1. The Curriculum Code and Its Sub-Codes.**

CURRICULUM

- Positive perception of the new curriculum (especially in Estonia)
- Knowledge application, experiments, real-world connections
- Knowledge construction, not reproduction
- Project activities
- Cross-curricular skills
- Functional reading
- PISA

Figure 2. **The Schooling Process Code and Its Sub-Codes.**

SCHOOLING PROCESS

- Extracurricular activities (trips, museums, factories, etc.), especially in science lessons
- Treating students in a friendly and respectful manner
- Personalized learning
- Group work
- Active learning
- Learning, not teaching
- IT

sociated with the Soviet era and is not supported by the teachers and administrators of Russian-language schools either.

A number of respondents in both Baltic states reported that changes in the curriculum and methods of its implementation were consistent with the PISA-format teaching strategies, meaning that school curricula had been developed drawing on the principles similar to those of the PISA assessment—hence, the test assessed the same skills that the new curriculum was designed to develop. As a result, Baltic school students' PISA scores in each of the subject areas (especially reading and science) improved.

Unlike in Estonia and Latvia, most teachers in Russia were still using the old teaching practices at the moment of the survey. The first national school curriculum based on a new, non-Soviet paradigm was proposed in 2009 and introduced in the first grade of elementary school in 2011. However, the respondents in Russia report little change in the teaching methods used even by retrained teachers since then. Besides, a major challenge was encountered by high school teachers. The new curriculum and the school-leaving examination in the form of the USE (Unified State Examination) pursued different goals, the former seeking to develop competencies and the latter, to test knowledge. Russian schools have not succeeded in personalizing their teaching practices. Most often, the respondents explain this failure by enormous teacher workloads: "*A teacher cannot make allowance for different student progress rates because it requires additional planning and differentiated assessment—but teacher workload is already too high.*" However, it follows naturally from the

interview data that teachers do not even bother trying to find personalized approaches to every student, not seeing it as key to the learning process (Fig. 2). What they mostly do is they build their teaching methods around the "average student". Therefore, the curriculum and teaching practices in Russian schools have changed very little in the post-Soviet period.

2.2.2. Advanced Teacher Training

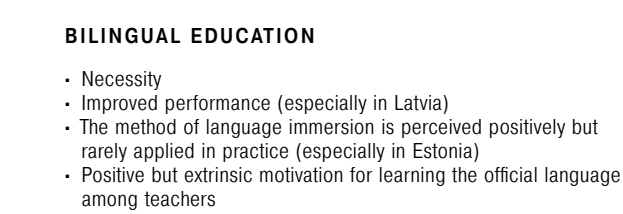
Major on-the-job training campaigns for school teachers and administrators were carried out in Estonia and Latvia. Among the courses they had taken over the recent years, the respondents mentioned the ones in which they had mastered new pedagogical practices that could be applied in teaching any discipline, such as personalized learning, classroom teamwork, project organization, real-world connections, new approaches to student assessment, and development of functional reading skills. The interviewees perceived such courses as useful and expressed interest in the relevant forms of professional development. In both countries, professional development courses were designed not only to provide teachers with new teaching methods and familiarize them with the curriculum changes but also to help them actually accept the new educational paradigm, the new system of values, and the new approaches. As one of the school principals said, "*Those courses have helped us shift away from the Soviet leadership model and do it our own, Estonian way; the overall thinking patterns concerning the school and students have changed*".

2.2.3. Bilingual Education

Bilingual education (Fig. 3) was one of the most debated and emotionally-charged issues in the interviews conducted in Latvian schools. The respondents were talking about advantages as well as pitfalls of such instruction. Bilingual education is considered the principal reform driver in Russian-language schools. Most school principals and teachers admit that it helps students succeed in adult life, but the integration process has been very tough for the schools. Teachers and administrators were most unhappy with the methods used to implement bilingual programs in the schooling practices. In addition, the interviewees were convinced that bilingual education had not promoted integration of the Latvian education system to the extent originally planned.

Nevertheless, bilingual education was referred to frequently when explaining the high PISA results of Russian-language schools. According to the school principals, learning two languages and switching between them during the school hours or even during a lesson promotes overall student development, which has led to achievements in a variety of domains, including the PISA. The principals of Russian-language schools were happy to see their students' PISA results improve. In 2012, Russian-language schools showed better performance in the PISA than Latvian-language ones, proving the effectiveness of bilingual instruction for school teachers and principals.

Figure 3. **The Bilingual Education Code and Its Sub-Codes.**



Along with bilingual education, a number of other initiatives were also taking place during the education reform period in the Baltic states, including teacher training courses on new student assessment methods, new teaching techniques, and latest instructional materials. It is highly probably that those initiatives played the determining role in the development of constructivist approaches to learning and promoted improvements in PISA performance.

In Estonia, bilingual instruction was originally regarded as a way to integrate students of Russian-language schools into the society. Bilingual programs are optional in elementary and middle school. The school principals rarely mentioned bilingual education when talking about student performance, but many of them expressed their positive attitude towards bilingual instruction practices, particularly language immersion activities; they had also noticed that more and more parents were willing to engage their children in such activities.

2.2.4. Examinations and the PISA

Student assessment principles and approaches often determine the teaching methods used [OECD2005; Erss, Kalmus, Autio 2016; Khavenson, Carnoy 2016]. In the Baltic states, final examinations take place at the end of the 9th and 12th grades. Many of the respondents see common features between those examinations and the PISA assessment: "*The exams do not copy the PISA, but they are based on the same principles*". Interviews with PISA coordinators in Latvia and Estonia also showed that the concepts of national school curriculum reform in those countries were in line with the OECD education objectives, which is largely reflected in PISA test questions. Participation in this international assessment, hence, is explained by the desire to see how well students have mastered the competencies measured by the PISA tests. In Russia, meanwhile, final examinations are focused much more on testing the level of knowledge, not competencies.

Latvian and Russian schools showed little interest in the PISA assessment, whereas schools in Estonia were motivated to participate. Given Estonia's serious approach to the PISA at a national scale [Khavenson, Carnoy 2016], greater involvement of schools in the project may entail better integration of Russian-language schools in Estonia than in Latvia.

Estonian school principals and their deputies often described the recent innovations in a positive or neutral way, feeling on the whole comfortable with the key reform principles. They showed a high level of readiness for trying out new practices and considered themselves active reform participants. The respondents in Latvia were more reserved in their evaluations of the reform and not too enthusiastic about the school transformations. While the Estonian interviewees often used the pronoun "*we*" (e.g. "*we are switching to...*", "*we are changing...*", "*we are trying...*") when discussing the educational change, their Latvian counterparts mostly used "*they*".

It follows from the interviews with officials of the Estonian Ministry of Education and Research that the Estonian government has put a great deal of effort to show school administrators and teachers that the changes proposed for Russian-language schools would promote integration and improve educational outcomes. The Ministry officials established personal contacts with schools, and it played a huge role. Russian-language school teachers and administrators emphasized that the government had engaged in a dialogue with them instead of imposing another bunch of requirements. Obviously, this governmental approach explains to a no small part the high degree of acceptance of the new educational paradigm among school teachers and administrators in Estonia.

The interview data indicates that components of the intended curriculum have been implemented in school education, and many of them have found manifestation in the teaching practices. Therefore, it can be inferred that the declared objectives of the curriculum reform are being achieved in classrooms.

2.3. Changes in PISA Performance: The Attained Curriculum

This study assumes that PISA results can be a good predictor of national curriculum attainment. Indeed, since the concept of PISA is largely consistent with the intended curricula of the Baltic countries, improvements in school students' PISA scores would imply a higher degree of curriculum attainment[4]. PISA performance in mathematics, reading and science was assessed in Russian- and majority-language schools. Regression equations (Table 2) were developed to test statistical significance of difference and control for the socioeconomic status at the individual and group levels.

2.3.1. Mathematics

Throughout the period of survey, Estonian-language schools performed better on the PISA mathematics literacy scale than Russian-language schools in both countries and Latvian-language

[4] We are not trying to establish a causal relationship to measure the contribution of specific curriculum aspects to PISA performance improvement. However, natural experiment methodology allows making less biased inferences than if traditional approaches to cross-sectional data analysis were used and hypothesizing on what exactly has worked.

Table 2. **PISA 2006–2015 Regression Analysis**

	Mathematics				Reading				Science			
	2006	2009	2012	2015	2006	2009	2012	2015	2006	2009	2012	2015
Type of School												
Russian-language schools in Latvia	–0.06 (0.07)	0.15** (0.07)	0.19*** (0.06)	–0.13** (0.06)	0.18*** (0.07)	0.22*** (0.06)	0.36*** (0.07)	0.03 (0.06)	–0.12** (0.06)	0.10 (0.07)	0.25*** (0.06)	0.15*** (0.06)
Latvian-language schools in Latvia	0.00 (0.05)	0.23*** (0.05)	0.16*** (0.05)	–0.11** (0.05)	0.30*** (0.05)	0.32*** (0.04)	0.21*** (0.05)	–0.09* (0.05)	0.01 (0.05)	0.26*** (0.05)	0.28*** (0.05)	0.05 (0.05)
Russian-language schools in Estonia	–0.11 (0.07)	0.11 (0.08)	0.18*** (0.07)	0.07 (0.07)	–0.15** (0.07)	0.12* (0.07)	0.16** (0.06)	0.02 (0.07)	–0.04 (0.07)	0.18*** (0.07)	0.34*** (0.07)	0.20*** (0.07)
Estonian-language schools in Estonia	0.34*** (0.05)	0.49*** (0.06)	0.44*** (0.05)	0.32*** (0.06)	0.58*** (0.05)	0.38*** (0.05)	0.43*** (0.05)	0.26*** (0.05)	0.48*** (0.04)	0.55*** (0.06)	0.63*** (0.05)	0.59*** (0.05)
Control variables (socioeconomic status):												
26–100 books in the home	0.30*** (0.05)	0.24*** (0.03)	0.36*** (0.04)	0.31*** (0.05)	0.34*** (0.05)	0.31*** (0.04)	0.29*** (0.03)	0.44*** (0.04)	0.33*** (0.05)	0.27*** (0.04)	0.39*** (0.04)	0.42*** (0.03)
Over 100 books in the home	0.58*** (0.05)	0.47*** (0.04)	0.57*** (0.05)	0.49*** (0.06)	0.53*** (0.06)	0.53*** (0.04)	0.50*** (0.04)	0.56*** (0.05)	0.54*** (0.06)	0.53*** (0.04)	0.59*** (0.04)	0.62*** (0.05)
Mother's education (high school)	–0.28** (0.14)	–0.12 (0.09)	–0.30*** (0.11)	–0.28** (0.11)	–0.27** (0.11)	–0.22** (0.11)	–0.24** (0.11)	–0.16 (0.11)	–0.26** (0.10)	–0.16 (0.11)	–0.24** (0.10)	–0.16 (0.10)
Mother's education (college degree)	0.15*** (0.04)	0.25*** (0.05)	0.20*** (0.06)	0.15** (0.06)	0.11*** (0.04)	0.22*** (0.04)	0.28*** (0.05)	0.16** (0.07)	0.13*** (0.04)	0.24*** (0.05)	0.26*** (0.05)	0.17*** (0.06)
Average number of books among classmates	0.19*** (0.03)	0.23*** (0.04)	0.20*** (0.04)	0.11*** (0.03)	0.24*** (0.04)	0.26*** (0.04)	0.30*** (0.04)	0.17*** (0.03)	0.21*** (0.03)	0.21*** (0.04)	0.23*** (0.03)	0.17*** (0.03)
Constant	–0.35*** (0.05)	–0.51*** (0.06)	–0.34*** (0.07)	–0.35*** (0.08)	–0.54*** (0.06)	–0.41*** (0.05)	–0.21*** (0.06)	–0.43*** (0.07)	–0.38*** (0.05)	–0.48*** (0.06)	–0.42*** (0.06)	–0.45*** (0.07)
R^2	0.13	0.15	0.14	0.07	0.16	0.18	0.19	0.11	0.14	0.13	0.18	0.11
Number of observations	14,227	13,881	13,655	15,798	14,227	13,881	13,655	15,798	14,227	13,881	13,655	15,798

*** p<0.01, ** p<0.05, * p<0.1
Robust standard errors in parentheses.
Control group: students in Russian schools; 0–25 books in the home, vocational education.

schools. As of 2006, performance in the latter three groups (Russian-language schools in Estonia, Russian-language schools in Latvia, and Latvian-language schools in Latvia) was nearly the same as in Russia. The students of Russian-language schools in Latvia who participated in the PISA in 2006 had started school in 1997–1998, when the reform had not yet been introduced. The next cohort—participants of the PISA 2009—had been attending school when the curriculum was changed. It can be seen from Table 2 that students of Russian-language schools in Latvia improved their performance in 2009 and outdid their counterparts in Russia in 2012.

A considerable improvement in mathematical literacy is observed between 2009 and 2012 in Estonia. Estonia initiated the reforms just after the PISA 2006, but improving the performance in mathematics that fast was a challenging task (as compared to the other subject areas), to some extent because mathematics had always been a strong component of Soviet education and teachers were reluctant to abandon the teaching methods that had been successful in the old paradigm in favor of the new curriculum. It was only by 2012 that step-by-step integration of tasks in applied mathematics had yielded an essential improvement in PISA scores.

2.3.2. Reading

Reading literacy performance of Estonian- and Latvian-language schools was statistically significantly higher than that of Russian schools during the whole period of survey. The gap kept growing until 2012. Changes in PISA performance of Russian-language schools were more in line with the reform process in Estonia than in Latvia. Consequently, they might be related to the curriculum transformations. Consistent and active implementation of functional reading in Estonia may have been the driver of the prominent improvement in reading literacy between 2006 and 2012.

2.3.3. Science

As with mathematics and reading, science literacy scores in all the language groups were higher in the Baltic states than in Russia in 2012, even though performance of Russian-language schools in Estonia and Latvia had been equal to or worse than that of Russian schools in 2006, at the very start of the survey. The year 2006 saw the first changes to the science curriculum of Russian-language schools in Estonia. Performance of those schools had enhanced by 2009 and continued improving until 2012. Latvia, on the other hand, introduced the new national school curriculum gradually, so it was not until 2012 that achieving high scores became possible.

By 2012, as a result, Russian-language schools in Estonia and Latvia had performed statistically significantly better in the PISA than schools in Russia, where the curriculum remained the same as in the Baltic states before the reform and had changed very little by then. The high PISA scores of Baltic school students and the upward trends

during the survey period indicate the gap between the intended and attained curricula in Latvia and Estonia being reduced.

Changes that had taken place by 2015 deserve special attention. On the one hand, PISA 2015 outcomes are rather distant in time from the reforms implemented, so their analysis is challenging within the framework of natural experiment methodology. By that time, all the countries had been introducing innovations not only as part of the curriculum reform but also under other initiatives. With regard to reform impact analysis, such concurrent innovations add noise to the inferences, making it impossible to compare changes in the attained curriculum to those in the intended and implemented curricula accurately enough. On the other hand, analysis of the 2015 PISA results may reveal long-term effects of the reforms, even if corrected for other possible factors.

Due to a variety of reasons, including curriculum changes, performance of Russian students in PISA reading and mathematical literacy had improved considerably by 2015 [Kapuza et al. 2017], being slightly higher than in both types of schools in Latvia, where the reform effects on PISA performance were apparently weaker and less consistent. Without outside pressure, Russian-language schools, which had not welcomed the new teaching approaches, could return to the old practices that they were used to. Estonian-language schools which had adopted a PISA-aligned curriculum long ago showed a consistently high level of performance in the 2015 assessment. No statistically significant difference is observed in the PISA scores in mathematics and reading between schools in Russia and Russian-language schools in Estonia. In addition to the decline of reform effects and the improvement in Russian students' PISA outcomes, other factors unrelated to the language used in teaching had become more powerful [Poder, Lauri, Rahnu 2017].

The dynamic of PISA results in science differs from that in reading and mathematics, Russian-language schools in both Baltic states remaining at a statistically significantly higher level of performance than schools in Russia in 2015. As the interview data indicates, both the science curriculum and teaching process were revised to a greater extent and accepted more readily by teachers, which led to more coherence between the implemented and intended curriculum as well as between the attained and implemented curriculum.

3. Conclusion and Discussion

Integration of ethnic minority groups became one of the problems faced by the education systems of the countries that emerged from the collapse of the Soviet Union. The Baltic states implemented some impressive education reforms, repudiating their Soviet past. The first wave of reforms was launched in the early 1990s. In both Estonia and Latvia, the reforms of the 1990s were targeted to majority-language schools, while Russian-languages schools joined the process later.

The reforms were seeking, in particular, to eliminate the divergences in curriculum between the schools using different languages in teaching. There is an opinion that this initiative promoted integration of the ethnic minority group into the national community—or at least it had this purpose. In order to find out whether the new curriculum was accepted by Russian-language schools, we analyzed the process of curriculum implementation and assessed the changes in student performance throughout the whole reform period.

Indeed, divergences between the intended, implemented and attained curriculum are being reduced. The intended curriculum, stipulated in the official regulations, is clearly observed in the learning process in Russian-language schools. The schools actively use the new teaching approaches, such as expanding the range of tasks designed to develop knowledge application and critical thinking competencies, functional reading activities, active learning, extracurricular activities, and, in particular, personalized learning and respect for students as the foundations of teaching policy. PISA performance of Russian-language schools was growing steadily during the whole period of survey, which indicates that the gap between the intended and attained curriculum is closing. It remains unclear, however, how long the reform effects will last. The 2015 PISA results show that the relative improvement of PISA scores in Russian-language schools has slowed down. The reasons may include, first of all, the reduced performance gap between Russian and Baltic schools as a result of the Russian curriculum reform and, second, subsequent reforms in the Baltic states that weakened the visible effects of the earlier innovations.

The interview data shows that school principals and teachers in Estonia perceived the reforms more positively than those in Latvia, showing a higher degree of recognition and acceptance. The reform procedures differed between Estonia and Latvia. Innovations in Estonia were introduced extensively and thus took less time. They were mostly designed to introduce specific teaching approaches and new curriculum practices. Estonian education authorities devoted more time and effort to bringing school administrators and teachers on their side. In Latvia, the first innovations met more resistance than in Estonia. School teachers and principals did not feel deeply involved in the reform process even if they sympathized the new approaches in general. Therefore, this study also demonstrates that healthy emotional environment makes the implementation of reform-related changes easier and more effective.

The quality and intensity of education reforms depend largely on whether the innovations are accepted by the parties involved. Nevertheless, this obvious step is often ignored by reform planners. Explaining the purposes, ensuring comprehensive professional training and development, and engaging all the parties in discussion and implementation may facilitate the acceptance and integration of innovations, ultimately saving resources in the broad sense of the word.

References

Anweiler O. (1992) Some Historical Aspects of Educational Change in the Former Soviet Union and Eastern Europe. *Education and Economic Change in Eastern Europe and the Former Soviet Union Oxford Studies in Comparative Education* (eds D. Phillips, M. Kaser), Wallingford, UK: Triangle Books, pp. 29–39.

Bempechat J., Jimenez N. V., Boulay B. A. (2002) Cultural-Cognitive Issues in Academic Achievement: New Directions for Cross-National Research. *Methodological Advances in Cross-National Surveys of Educational Achievement* (eds A. C. Porter, A. Gamoran), Washington, DC: National Academies, pp. 117–149.

Borisenkov V. (2006) Strategiya obrazovatelnykh reform v Rossii (1985–2005 gg.) [Educational Reform Strategy in Russia (1985–2005)]. *Pedagogika*, no 7, pp. 3–16.

Carnoy M., Khavenson T., Ivanova A. (2015) Using TIMSS and PISA Results to Inform Educational Policy: A Study of Russia and its Neighbours. *Compare: A Journal of Comparative and International Education*, vol. 45, no 2, pp. 248–271.

Dedze I., Catlaks G. (2001) Who Makes Education Policy in Latvia? *Peabody Journal of Education*, vol. 76, no 3–4, pp. 153–158.

Bureau Central de Statistique de Estonie (1937) *Eesti Arvudes. Estonie en Chiffres. Resume Retrospectif de 1920–1935*. Tallinn: Bureau central de statistique de Estonie.

Erss M., Kalmus V., Autio T. H. (2016) 'Walking a Fine Line': Teachers' Perception of Curricular Autonomy in Estonia, Finland and Germany. *Journal of Curriculum Studies*, vol. *48*, no 5, pp. 589–609. Available at: https://doi.org/10.1080/00220272.2016.1167960 (accessed 10 July 2019).

Erss M., Mikser R., Löfström E., Ugaste A., Rõuk V., Jaani J. (2014) Teachers' Views of Curriculum Policy: The Case of Estonia. *British Journal of Educational Studies*, vol. 62, no 4, pp. 393–411.

Herbst M., Wojciuk A. (2017) Common Legacy, Different Paths: The Transformation of Educational Systems in the Czech Republic, Slovakia, Hungary and Poland. *Compare: A Journal of Comparative and International Education*, vol. 47, no 1, pp. 118–132.

Heyneman S. P. (1998) The Transition from Party/State to Open Democracy: The Role of Education. *International Journal of Educational Development*, vol. 18, no 1, pp. 21–40.

Heyneman S. P., Catlaks G., Dedze I. (2001) *A Passport to Social Cohesion and Economic Prosperity*. Riga, Latvia: Soros Foundation.

Kangro A., James D. (2008) Rapid Reform and Unfinished Business: The Development of Education in Independent Latvia 1991–2007. *European Journal of Education*, vol. 43, no 4, pp. 547–561.

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., Carnoy M. (2016) The Unintended and Intended Academic Consequences of Educational Reforms: The Cases of Post-Soviet Estonia, Latvia and Russia. *Oxford Review of Education*, vol. 42, no 2, pp. 178–199.

Kitsing M. (2011) *Feasible Reasons for Estonian Results in* PISA-*Survey*. Paper Presented at the Conference at the National Institute for Certified Educational Measurements (Bratislava).

Latvian Centre for Human Rights and Ethnic Studies (2004) *Minority Education in Latvia*. Vienna. Available at: https://fra.europa.eu/sites/default/files/fra_uploads/275-EDU-Latvia-final.pdf (accessed 10 July 2019).

Leech N. L., Onwuegbuzie A. J. (2009) A Typology of Mixed Methods Research Designs. *Quality & Quantity*, vol. 43, no 2, pp. 265–275.

Livingstone I. D., Postlethwaite N. T., Travers K. J., Suter L. E. (1986) *Second International Mathematics Study. Perceptions of the Intended and Implemented Mathematics Curriculum*. Washington, DC: Center for Statistics (OERI/ED).

Logvina I. (2014) *Funktsionaalse Kirjaoskuse Arendamine ja Hindamine Koolis Teksti Lugemisel ja Mõistmisel*. Narva, Estonia.

Martin M. O. (1996) *Third International Mathematics and Science Study: An Overview*. Chestnut Hill, MA: Boston College.

Mitter W. (1992) Education in Eastern Europe and the Former Soviet Union in a Period of Revolutionary Change: An Approach to Comparative Analysis. *Education and Economic Change in Eastern Europe and the Former Soviet Union* (eds D. Phillips, M. Kaser), Wallingford, UK: Triangle Books, pp. 15–28.

Njeng'ere D. (2014) *The Role of Curriculum in Fostering National Cohesion and Integration: Opportunities and Challenges*. Geneva, Switzerland: UNESCO International Bureau of Education.

OECD (2001a) *Reviews of National Policies for Education: Latvia 2001*. Paris: OECD.

OECD (2001b) *Reviews of National Policies for Education: Estonia 2001*. Paris: OECD.

OECD (2005) *Assessment for Learning Formative Assessment*. Paris: OECD, Centre for Educational Research and Innovation.

Poder K., Lauri T., Rahnu L. (2017) *Challenges Facing the Estonian School System: The Achievement Gap between Language-Stream Schools and School Choice by Immigrants*. Estonian Human Development Report 2016/2017. Available at: https://inimareng.ee/en/immigration-and-integration/challenges-facingthe-estonian-school-system (accessed 10 July 2019).

Rannut M. (1991) Beyond Linguistic Policy: The Soviet Union versus Estonia. ROLIG *Papir*, vol. 48, pp. 23–52.

Raun T. U. (2009) Estonia after 1991: Identity and Integration. *East European Politics & Societies*, vol. 23, no 4, pp. 526–534.

Silova I. (2002b) Bilingual Education Theater: Behind the Scenes of Latvian Minority Education Reform. *Intercultural Education*, vol. 13, no 4, pp. 463–476.

Silova I. (2002a) The Manipulated Consensus: Globalisation, Local Agency, and Cultural Legacies in Post-Soviet Education Reform. *European Educational Research Journal*, vol. 1, no 2, pp. 308–330.

Soros Foundation—Latvia. (2001) A Passport to Social Cohesion and Economic Prosperity: Report of Education in Latvia 2000. *Peabody Journal of Education*, vol. 76, no 3–4, pp. 159–174.

Spreen C. A. (2004) Appropriating Borrowed Policies: Outcomes-Based Education in South Africa. The Global Politics of Educational Borrowing (ed. G. Steiner-Khamsi), New York: Teachers College, pp. 101–113.

Statistical Office of Estonia, Central Statistical Bureau of Latvia and Statistics Lithuania, (2003) *2000 Round of Population and Housing Censuses in Estonia, Latvia, and Lithuania*. Vilnius: Statistical Office of Estonia, Central Statistical Bureau of Latvia and Statistics Lithuania.

Statistics Estonia (2016) *Population by Ethnic Nationality*. Available at: https://www.stat.ee/34278 (accessed 10 July 2019).

Vihalemm T., Hogan-Brun G. (2013) Language Policies and Practices across the Baltic: Processes, Challenges and Prospects. *European Journal of Applied Linguistics*, vol. 1, no 1, pp. 55–82.

Academic Dishonesty among College Students: Academic Motivation vs. Contextual Factors

E. Shmeleva, T. Semenova

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Evgeniia Shmeleva
Junior Research Fellow, Center of Sociology of Higher Education, Institute of Education, National Research University Higher School of Economics. E-mail: eshmeleva@hse.ru
Tatiana Semenova
Junior Research Fellow, Center of Sociology of Higher Education, Institute of Education, National Research University Higher School of Economics. E-mail: tsemenova@hse.ru

Address: 20 Myasnitskaya St, 101000 Moscow, Russian Federation.

Abstract. Academic dishonesty among college students is often associated with low academic motivation, which has been confirmed by multiple international findings. However, the role of academic motivation may be overestimated, as such studies do not normally control for contextual factors such as faculty and peer behavior. This study utilized the theoretical framework of Eric M. Anderman and Tamera B. Murdock to identify the factors of academic dishonesty and the self-determination theory of Edward L. Deci and Richard M. Ryan to measure academic motivation. Longitudinal data on students of four Russian universities participating in the Project 5–100 (N=914) is used to measure the ability of academic motivation to predict academic cheating and plagiarism rates while controlling for contextual factors. Regression analysis shows that academic motivation becomes insignificant as a predictor as soon as perceived consequences and peer effects come into play. The best predictor of both plagiarism and cheating is students' perception of contextual factors, i. e. perceived prevalence of relevant behaviors among peers. Unlike with cheating, plagiarism rates are not contingent on the probability of punishment.
Keywords: higher education, academic dishonesty, plagiarism, cheating, academic motivation, self-determination theory.

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Academic dishonesty including cheating and plagiarism in written papers [Pavela 1997], is pervasive in Russian higher education. According to the 2014 Monitoring of Education Markets and Organizations (MEMO), nearly one in five students admit having plagiarized (copied pieces of source text without proper citation), bought papers (essays, reports, term papers) from essay mills, or used cheat sheets in an exam/test [Roshchina, Shmeleva 2016]. Another study involv-

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ing students in economics and management programs of eight Russian universities found that one in six students believe that most exams and tests at their university can be passed by cheating, and over one third are convinced that many of their peers buy papers online [Maloshonok 2016].

A variety of factors are proposed by researchers to explain the high incidence of academic dishonesty Studies show that a lot of students consider academic dishonesty to be an acceptable and justified educational strategy [Lupton, Chapman 2002; Poltorak 1995; Denisova-Schmidt, Huber, Leontyeva 2016], which may stem from school experiences [Latova, Latov 2007] and overall tolerance of corrupt practices in Russia [Magnus et al. 2002; Denisova-Schmidt 2017; 2018]. Some researchers believe that academic dishonesty in Russian higher education may be aggravated by certain peculiarities of the system [Magnus et al. 2002; Denisova-Schmidt, Huber, Leontyeva 2016; Leontyeva 2010], such as the funding model that makes it unprofitable for colleges to dismiss students for academic dishonesty [Denisova-Schmidt 2017; Golunov 2013]. Scholars also emphasize insufficiency of the anti-fraud policies implemented by universities and faculty [Shmeleva 2016; Golunov 2013].

A number of Russian studies have found low student academic motivation to be another factor of high academic dishonesty rates in Russian colleges [Gizhitsky 2014; Gizhitsky, Gordeeva 2015; Shmeleva 2016]. Researchers in Russia as well as in other countries demonstrate that students primarily seeking to learn new knowledge or skills are less likely to cheat than those motivated by extrinsic or performance factors, such as grades or social comparison [Jordan 2001; Rettinger, Jordan 2005; David 2015].

However, the majority of publications studying the relationship between academic motivation and dishonest behaviors do not take into account the influence of contextual factors, which are the most powerful predictors of academic dishonesty [McCabe, Trevino, Butterfield 2001; McCabe, Feghali, Abdallah 2008]. As a result, the role of academic motivation in explaining and predicting academic dishonesty may be overestimated, since such contextual factors as faculty attitudes and actions [Simon et al. 2004; Yu et al. 2016; Broeckelman-Post 2008], peer behavior [McCabe, Trevino, Butterfield 2001; 2002; McCabe, Feghali, Abdallah 2008; Megehee, Spake 2008; Ma, McCabe, Liu 2013], and existence and effectiveness of honor code systems [Arnold, Martin, Bigby 2007; McCabe, Trevino, Butterfield 2002] are significantly related to academic dishonesty. For instance, studies conducted in different cultural contexts show that students who perceive academic dishonesty as commonplace among peers are significantly more likely to engage in dishonest practices themselves [Ma, McCabe, Liu 2013; McCabe, Trevino, Butterfield 2002].

Besides, researchers exploring the relationship between cheating in higher education and academic motivation usually approach

motivation as a goal that students seek to achieve, so they measure it using the tools proposed by achievement goal orientation theory [David 2015; Murdock, Hale, Weber 2001; Anderman, Koenka 2017; Koul 2012; Ozdemir Oz, Lane, Michou 2016]. However, the typology of goals suggested by this theory distills all the diverse goals to only two, discriminating between "mastery" and "performance" goal orientations (as tendencies to achieve positive or avoid negative outcomes, respectively), and excludes goal overlapping. Other researchers use the binary concept of extrinsic vs intrinsic motivation [Rettinger, Jordan 2005; Jordan 2001]. This model, however, is oversimplified, as there is empirical evidence of various subtypes of extrinsic motivation with differing degrees of autonomy in the initiation and regulation of intentional behavior [Vansteenkiste et al. 2010; Ryan, Deci 2000].

This study seeks to shed light on the relationship between academic dishonesty and student academic motivation, overcoming the limitations. Academic motivation is measured using self-determination theory [Ryan, Deci 2000], which offers a more elaborated typology of motivation than the one proposed by achievement goal orientation theory [Maloshonok, Semenova, Terentev 2015]. Meanwhile, contextual factors are controlled for, allowing a more accurate evaluation of the role of academic motivation in predicting academic dishonesty. In addition, the study separately examines the relationship between academic motivation and dishonest behaviors such as plagiarism and cheating on exams, as factors of their prevalence may differ significantly [Passow et al. 2006]. Therefore, in this paper we answer the following research question:

How does the student academic motivation contribute to the explanation of academic dishonesty controlling for contextual factors?

The paper uses data on 914 students of four Russian universities participating in the Project 5–100 (designed to sharpen the competitive edge of Russian colleges in the global scene) that was collected during two rounds of a longitudinal survey performed in fall 2015 (when the students were freshmen) and in spring 2016.

1. Theoretical Framework

This study utilizes the theoretical framework of Tamera B. Murdock and Eric M. Anderman [Murdock, Anderman 2006], derived from a systematized set of data obtained in a variety of correlational studies and quasi-experiments devoted to academic dishonesty. The proposed model approaches academic dishonesty as motivated actions that students decide to take depending on their (a) goals, (b) expectations for accomplishing those goals, and (c) assessments of the costs associated with academic dishonesty (Fig. 1).

International findings indicate that *academic goals* are significantly related to cheating behavior [Jordan 2001; Rettinger, Jordan 2005; David 2015]. The goals pursued by students reflect their *academic motivation*, i. e. educational outcomes that they want to accom-

Figure 1. **Murdock and Anderman's Theoretical Framework** [Murdock, Anderman 2006]

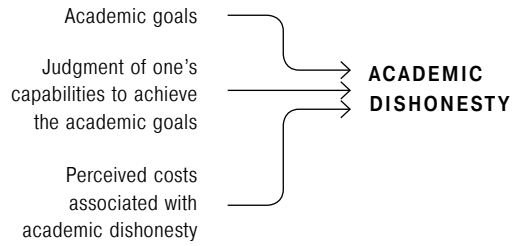
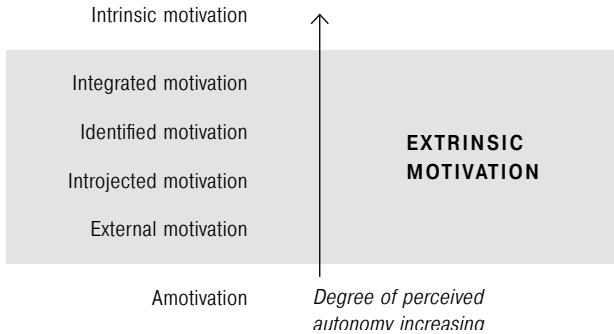


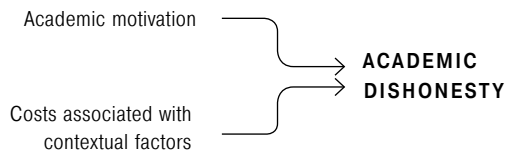
Figure **2. Motivation Typology According to Self-Determination Theory [**Ryan, Deci 2000]



plish. The original model approaches academic motivation through the prism of *achievement goal orientation theory*, distinguishing between mastery-oriented students willing to master a particular body of knowledge and performance-oriented students focused on showing evidence of their ability and avoiding failure [Ames, Archer 1988; Elliot 2005]. A great deal of findings indicate that students are more likely to engage in malpractices if they pursue performance goals of obtaining good grades or showing how smart they are [Newstead, Franklyn-Stokes, Armstead 1996; Anderman, Griesinger, Westerfield 1998] and if they avoid appearing incompetent to their peers [Anderman, Koenka 2017].

Exploiting a binary typology of goals, this theory does not allow embracing the whole spectrum of motivation. For this reason, we draw on *self-determination theory* [Ryan, Deci 2000], which understands academic motivation as the cause of the initiation and regulation of student behavior. This theory discriminates among *intrinsic motivation*, four types of *extrinsic motivation*, and *amotivation*. All of those can be plotted on a single continuum with varying degrees of perceived

Figure 3. **Proposed Theoretical Framework**



autonomy (Fig. 2). *Intrinsically-motivated* students engage in learning for the sake of interest and enjoyment, so this type of motivation is associated with the highest degree of autonomy. *Extrinsically-motivated* students initiate and regulate their actions being driven by external stimuli—external objects related to learning behavior indirectly, such as grades or other incentives (*external motivation*), social norms (*introjected motivation*), perception of an activity as important (identified motivation) and valuable (*integrated motivation*). *Amotivated* students have no motivation to engage in learning.

Murdock and Anderman maintain that academic dishonesty is also affected by *perceived costs of cheating*, which are determined by contextual factors and students' level of moral reasoning. Contextual factors are conditions formed by the learning environment that may promote or hinder academic dishonesty. These include institutional policy to detect and prevent plagiarism and cheating, peer and faculty behavior, and perceived proportion of cheaters going unpunished.

This study zeroes in on the relationship between *academic motivation* and *academic dishonesty*, while making allowance for perceived costs associated with contextual factors, namely faculty and peer attitudes. It is assumed that students with higher levels of academic motivation and perceived costs are less likely to cheat. The adjusted theoretical framework based on Murdock and Anderman's theory is presented in Figure 3.

2. Method

2.1. Data

Data on students of four leading universities of Russia participating in the Project 5–100[1], collected during Trajectories and Experiences of University Students in Russia, a longitudinal survey organized by the Higher School of Economics Institute of Education, provided the empirical basis of research. The survey was targeted at students enrolled in 2015 to various education programs, intending to measure their educational experiences and trajectories. This article uses data obtained

[1] The complete list of 14 universities participating in the Project 5–100 in 2015 is available at https://ioe.hse.ru/collaborative_project/members

Table 1. **Descriptive Statistics**, n = 914

Variable	Description	%
Gender	Female	60.1
	Male	39.9
Mother's education	No college degree	19.8
	College degree	80.2
University	University 1	49.0
	University 2	10.7
	University 3	25.9
	University 4	14.4
Program	STEM	40.5
	Humanities, economics, and social sciences	59.5
Type of funding	State funding	70.5
	Self-funding or apprenticeship contract	29.5
Self-assessed performance	Straight A's	10.9
	A's and B's	43.9
	Mostly A's and B's, some C's	34.0
	Mostly C's	11.2

in two rounds of the survey. The first round was administered during the fall term of 2015. Every first-year student in the selected programs was emailed an invitation to participate in a longitudinal survey with a link to the online questionnaire. The first-round questionnaire consisted of items on entrants' demographic and socioeconomic characteristics, their expectations about university experience, and a module devoted to academic motivation and perceived academic norms. Invitation to participate in the first round was accepted by 1,149 students out of the 8,597 who were sent invitation emails (the average response rate being 16%).

The second round of the survey took place in the spring term of 2016. Respondents to round one were emailed an invitation to participate in the second round. The email contained a link to the online questionnaire designed to measure students' academic engagement, satisfaction, self-assessed performance, academic motivation, and frequency of academic dishonesty. The second-round survey had a response rate of 78% (n = 914).

Table 1 presents descriptive statistics for the sample. Over half of the participants (60%) were enrolled in humanities, economics, and social science programs, of which Economics and Management and

Sociology/ Social Science were represented the most. The rest of the respondents were enrolled in STEM programs (41%), Information & Computer Science and Electrical/ Electronics Engineering Technology being the most popular ones. Women accounted for more than half of the sample (60%). Most students participating in both rounds of the survey were enrolled in state-funded programs (71%).

2.2. Instruments for Measuring Academic Motivation

Two rounds of the survey measured students' motivational characteristics. The first round used an abridged version of the *Academic Motivation Scale* instrument developed by Robert J. Vallerand and his colleagues [Vallerand et al. 1992]. The questionnaire consists of ten items on reasons for engaging in higher education, which students are asked to rate on a seven-point scale. This instrument measures intrinsic motivation, three types of extrinsic motivation—identified, introjected, and external—and amotivation[2]. In the second round of the survey, academic motivation was assessed using the *Scales of Academic Motivation* questionnaire validated by Tamara Gordeeva, Oleg Sychev, and Evgeny Osin [2014]. Being composed of 28 items on reasons for attending university, each to be rated on a five-point scale, this instrument measures three types of intrinsic motivation (intrinsic cognition, achievement, and personal growth), three types of extrinsic motivation (motivation for self-respect, introjected, and external), and amotivation (examples of items measuring academic motivation in both rounds are given in Table A1 of Appendix).

To determine the relationship between academic motivation and academic dishonesty, the Relative Autonomy Index (RAI) was constructed using the methodology proposed in [Sheldon et al. 2017] for the levels of motivation measured at the beginning and at the end of the first year.

First of all, we checked to what extent the types of motivation were falling into two groups, autonomous[3] vs controlled[4] [Ibid.]. Hierarchical cluster analysis found all the items falling perfectly into the two groups and all the indicators being properly grouped, except those related to motivation for self-respect (they were added to the autonomous group instead of the controlled one). After verifying that empirical findings are consistent with the theoretical binary division, factors for each type of academic motivation were extracted. Exploratory factor analysis showed that over 60% of the variance was explained by a single factor for all the types of motivation. All the motivation factors

[2] Theory also postulates integrated motivation as another type of extrinsic motivation, meaning that an individual integrates an activity into their value system, yet it is not measured empirically [Vallerand et al. 1992].

[3] Autonomous motivation includes all the types of intrinsic motivation and the identified type of extrinsic motivation.

[4] Controlled motivation includes amotivation and all the types of extrinsic motivation except the identified type.

Figure 4. **Distribution of the Index of Academic Motivation Reflecting the Degree of Relative Autonomy in the First Round of the Longitudinal Survey**

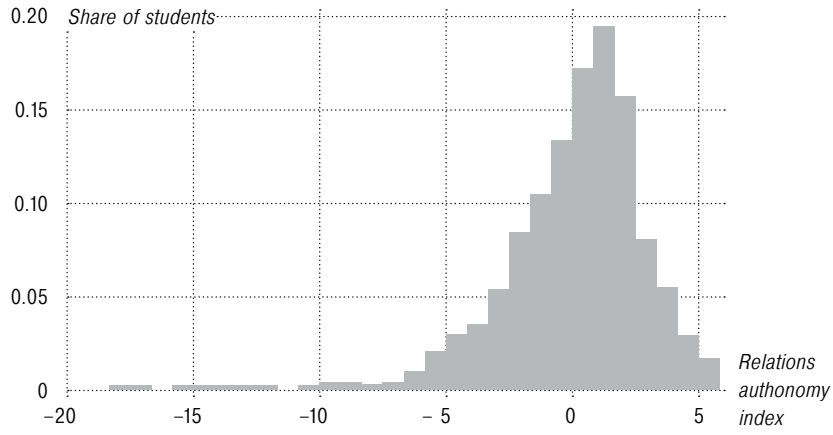
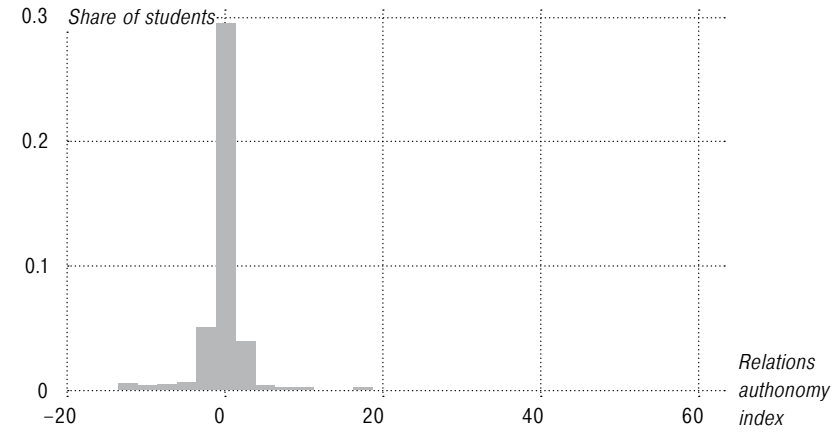


Figure 5. **Distribution of the Index of Academic Motivation Reflecting the Degree of Relative Autonomy in the Second Round of the Longitudinal Survey**



proved to be highly reliable (Cronbach's $\alpha > 0.7$), except the factor of *introjected motivation* assessed during the first-round survey (Table A2, Appendix). The index of academic motivation (IAM) was calculated using the extracted factors except the factor of *introjected motivation* (for the first-round IAM) and that of motivation for self-respect (for the second-round IAM). The IAM distribution is shown in Figures 4 and 5 for the first and second rounds of the longitudinal survey, respectively. Most students demonstrated a high degree of relative au-

tonomy at the beginning of the first year, which implies that intrinsic motivation prevailed at entry (Fig. 4).

The RAI drops by the end of the first year at university, bringing the academic motivation of most students to the medium level, meaning that their attendance was determined by intrinsic as well as extrinsic stimuli at that time (Fig. 5).

2.3. Instrument for Measuring Academic Dishonesty

The second round of the survey was measuring the self-reported frequency of cheating and plagiarism among students. The incidence of plagiarism was measured by the item, "How many times have you copied fragments from other publications or books (including online sources) without citing the source?" To assess the frequency of cheating, students were asked, "How many times have you used cheat sheets (including on a mobile device) or copied from other students during an exam or test?" Students could assess the frequency of cheating and plagiarism on a four-point scale involving "Never", "Once or twice", "3–5 times", and "More than 5 times".

The second round also assessed the costs of academic dishonesty, expressed by three measures, (a) perceived likelihood of severe punishment for cheating and plagiarism, (b) probability of plagiarism check, and (c) perceived prevalence of cheating and plagiarism among fellow students.

In order to measure perceived likelihood of severe punishment for cheating and plagiarism and the probability of plagiarism check, we asked students to assess the following situations as very likely, moderately likely, or unlikely: (i) "Instructors at my university will remove a student from the classroom if they find them cheating during an exam or test"; (ii) "Instructors at my university will give bad grades if they detect plagiarism in written assignments"; and (iii) "Instructors will check my written assignment (e. g. essay or report) for plagiarism".

Perceived prevalence of plagiarism and cheating among fellow students was assessed using questions about the percentage of students who engage in those dishonest practices on a regular basis. The respondents were offered the following options: "No one does it", "Some students do it", "Most students do it", "Everyone does it", and "Don't know".

The first round also analyzed students' tolerance of plagiarism and cheating in terms of institutional policies. Students were asked whether they considered acceptable copying fragments from other publications or books (including online sources) without citing the source, and using cheat sheets (including on a mobile device) or copying from other students during an exam or test. The "Don't know" response option was also available. Intolerance to plagiarism was reported by 91% of freshmen, and intolerance to cheating ("inacceptable") by 83%. These measures were used as control variables in the regression models.

Half of the survey participants engaged in academic dishonesty at least once during their first year at the university (Fig. 6). Cheat-

Figure 6. **Frequency of Plagiarism and Cheating**

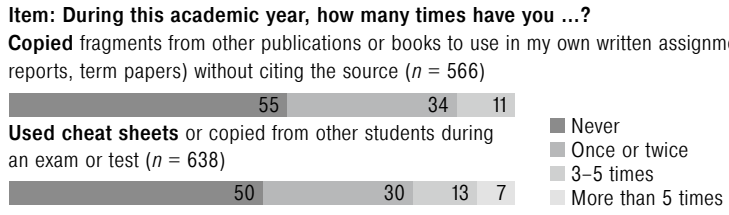


Figure 7. **Percentage of Students Who Have Never Cheated or Plagiarized Across the Surveyed Universities**

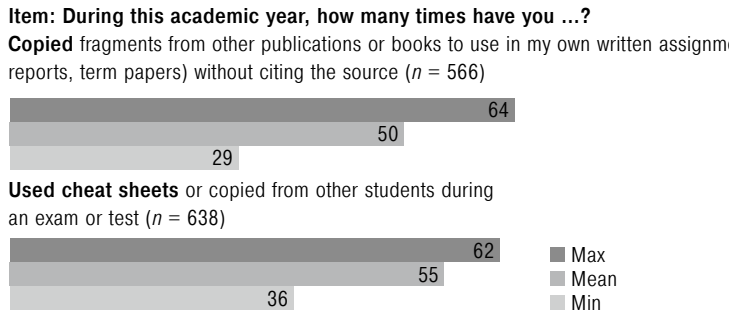


Figure 8. **Perceived Prevalence of Cheating and Plagiarism among Fellow Students**

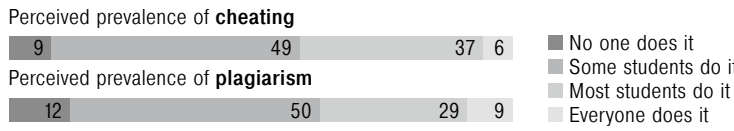
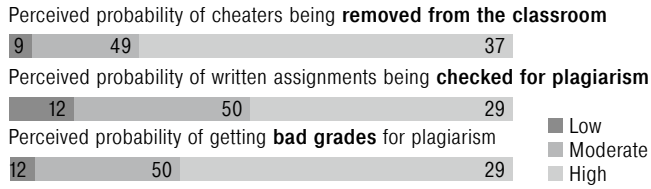


Figure 9. **Perceived Probability of Severe Punishment and Plagiarism Checks**



ing was found to be more prevalent than plagiarism. Seven percent of the students reported having cheated on an exam or test more than five times, but none had copied fragments from other works that often.

Plagiarism and cheating rates vary greatly across the universities (Fig. 7). The percentage of students who have never committed pla-

giarism is 29% in one of the institutions and twice as high (64%) in another one[5]. Variation in the frequency of cheating is relatively lower, 36–62%[6].

Students perceive the prevalence of cheating and plagiarism among peers as high, one in three respondents being convinced that most of their fellow students engage in plagiarism and cheating (Fig. 8).

Although most students believe that academic dishonesty is pervasive among their peers, two thirds of the respondents report a high likelihood of severe punishment for plagiarism and cheating (Fig. 9). At the same time, only half of the participants assess plagiarism checks as highly probable.

3. Findings

3.1. The Contribution of Academic Motivation to the Explanation of the Frequency of Academic Dishonesty Controlling for Contextual Factors

This study aimed to assess the relationship between academic dishonesty and academic motivation while controlling for contextual factors. The incidence of copying fragments from other sources without proper citation and the incidence of cheating during an exam or test were used as dependent variables[7]. As these variables are ordinal, analysis involved constructing ordinal logistic regression models which allowed evaluating the chances of falling under each of the categories (in this case, categories of frequency of academic dishonesty).

Three regression models were estimated for each of the dishonest practices. Model 1 only included academic motivation indicators (for first- and second-year students). The second regression model adds individual characteristics of students, which, according to studies, can be related to differences in the frequency of cheating and plagiarism [Shmeleva, 2015], namely the characteristics of students (gender, level of education of parents), their self-assessment of learning achievement, place of study (university and training direction).

This model also took account for students' perception of institutional norms regarding academic dishonesty. Since students were surveyed at the beginning of their college studies (in September), this variable is regarded as a proxy for students' individual expectations about the existing university rules regarding academic dishonesty, not as a contextual factor. Model 2 allows measuring the role of academic motivation as compared to other individual student characteristics. As the frequency of academic dishonesty may also be affected by contextual factors, Model 3 additionally took into account

[5] Significance level = 0.001.

[6] Significance level = 0.05.

[7] When constructing the models, we excluded students who gave the no-opinion response ("Don't know") to how often they cheated and plagiarized from the analysis. As a result, 638 observations formed the sample in the model with plagiarism rate as the dependent variable. As for the model assessing the frequency of cheating, the sample consisted of 566 observations.

the indicators describing perception of faculty and peer behaviors. It thus allows identifying how academic motivation determines the frequency of plagiarism and cheating while controlling for individual student characteristics as well as contextual factors describing the learning environment.

Analysis of variance as well as Akaike and Bayesian information criteria were used to compare the quality of the models constructed. The Model 3 demonstrated the best goodness of fit for both plagiarism and cheating compared to other models.

3.2. Models Explaining the Frequency of Plagiarism

Results of regression analysis show that the frequency of plagiarism in written assignments is not related to academic motivation of first-year students, yet it is negatively related to motivation measured during the second year of studies. However, the correlation disappears when contextual factors are added to the model (Table A3, Appendix). This means that students with different levels of relative autonomy are equally likely to commit plagiarism in similar learning environments.

Perceived costs of plagiarism were found to be related only partly to the frequency of engaging in this practice, perceived peer behavior appearing to be the only significant predictor. Indeed, the frequency of plagiarism increases dramatically if students believe that most or all of their peers tend to use fragments from other texts without crediting the source. Meanwhile, faculty behavior is not affecting students' decision to plagiarize—the variables describing perceived probability of plagiarism check and punishment in case of detection were found to be insignificant in the model. Consequently, students plagiarize regardless of the associated risks, being guided by perceived prevalence of plagiarism among fellow students in the first place.

The frequency of plagiarism varies greatly across the institutions, the university variable remaining significant even when academic motivation, contextual factors, and other control variables are taken into account. Besides, the frequency of using fragments from other sources without proper citation is related to self-assessed performance. Students getting mostly C's are more likely to plagiarize than straight-A students, the inference remaining robust when the model controls for perceived probability of plagiarism check and punishment. Perceptions of institutional norms measured in first-year students proved to be significant in Model 2. Students who perceived their university as intolerant to plagiarism at entry were less likely to plagiarize, no matter their academic motivation. However, this variable lost its deterring effect as soon as contextual factors were added to the model, which may indicate that perceptions of institutional policies are ultimately irrelevant.

3.3. Models Explaining the Frequency of Cheating

Just as with plagiarism, higher levels of academic motivation measured during the second year of studies correlate with lower frequency of cheating, but this effect fades away when contextual factors come

into play (Table A4, Appendix). No relationship was found between academic motivation assessed at the beginning of the first year and the frequency of cheating.

Another parallel finding is that peer behavior is a significant predictor of cheating rates. Students who believe that most of their peers cheat are significantly more likely to cheat on an exam themselves than those who perceive the prevalence of cheating as low ("No one does it" or "Some students do it").

In contrast to plagiarism, the frequency of cheating turns out to be related to perceived costs associated with faculty behavior. The higher perceived probability of punishment for cheating, the lower the frequency. Meanwhile, cheating rates do not vary across the universities surveyed as the university variable loses its significance in Model 3, which controls for both academic motivation and perceived costs. This way, the frequency of cheating appears to be more situational and more related to the perceived faculty behavior than the frequency of plagiarism, the latter, in contrast, varying greatly across the institutions but showing no correlation with faculty behavior.

Similarly to plagiarism, the frequency of cheating is related to self-assessed performance, being higher among students who mostly get C grades. Besides, students who perceived their university as intolerant to cheating were less likely to cheat on exams/tests at the end of the first year. However, this effect ceases to be significant ($p < 0.1$) as soon as contextual factors are added to the model—which was also observed for plagiarism.

4. Limitations

This study has some limitations which have to be taken into account when extrapolating its findings. First, its theoretical framework differs from the original version in that analysis excludes self-efficacy as one of the factors affecting academic dishonesty. However, the purpose of this study was to explore the relationship between academic motivation and academic dishonesty while controlling for contextual factors, not to test the validity of the original theoretical framework proposed by Murdock and Anderman [Murdock, Anderman 2006]. Second, the relationship between academic motivation and academic dishonesty was analyzed using self-reported data collected from students' responses to sensitive questions about cheating and plagiarism, so it is entirely possible that the prevalence of academic dishonesty among university students is underestimated in this study. Third, the panel sample could have been biased by self-selection towards more motivated, responsible, and engaged students. For instance, some studies [Dey 1997; Porter, Whitcomb 2005] indicate that respondents to student surveys are more likely to be high-performing, socially engaged, and financially secure.

5. Discussion

There is a long-held belief among Russian faculty that students bear responsibility for their academic success and honesty, and a tendency to explain students' academic failures by their lack of "desire to learn" [Terentev et al. 2015]. The widespread opinion, "Who wants to study, will study"[8], reflects the pivotal role of academic motivation, the lack of which may push students to cheat. The relationship between academic motivation and academic dishonesty has also been confirmed empirically by researchers in Russia [Gizhitsky 2014; Gizhitsky, Gordeeva 2015] and other countries [Rettinger, Jordan 2005; David 2015; Anderman, Koenka 2017].

This study was designed to assess this relationship while controlling for contextual factors, which may affect the frequency of academic dishonesty to a significant extent. Drawing upon the theoretical framework proposed by Murdock and Anderman [Murdock, Anderman 2006], we assessed the effects of academic motivation, controlling for the costs of plagiarism and cheating associated with faculty and peer behavior as perceived by students of four Russian universities involved in the Project 5–100.

5.1. Contextual Factors Are More Important than Academic Motivation

This study demonstrates that the frequency of dishonest practices—both plagiarism and cheating—does not depend on students' relative autonomy in the regulation of their behavior. Instead, it is related to contextual factors, such as perceived peer behavior and perceived probability of punishment. These inferences are consistent with earlier findings demonstrating the great influence of peer and faculty behavior on the frequency of academic dishonesty [Broeckelman-Post 2008; McCabe, Trevino, Butterfield 2001; 2002; McCabe, Feghali, Abdallah 2008; Megehee, Spake 2008; Ma, McCabe, Liu 2013; Simon et al. 2004; Yu et al. 2016; Shmeleva 2016].

This study did not reveal a significant relationship between the probability of punishment for using fragments of others' works and the frequency of plagiarism—quite surprisingly, as more than half of the respondents reported high rates of plagiarism checks and punishment in case of detection at their universities. Perhaps, these findings indicate insufficiency of the measures to prevent academic dishonesty. First, despite the relatively high probability of plagiarism checks and punishment, a lot of students witness academic dishonesty around them, 38% of the participants being convinced that most of their peers plagiarize. In this case, the experience of observing fellow students avoiding punishment for plagiarism may be a more powerful factor than perceptions of the probability of being caught [Freiburger et al. 2017]. Second, even though instructors do plagiarism checks, actually detecting plagiarism may be a challenge, which low-

[8] "It Was Only in My First Exam Session that I Didn't Cheat": Why Russian Students Cheat, and International Attitudes towards Academic Dishonesty: https://paperpaper.ru/cheating/

ers the perceived likelihood of punishment as well as the perceived costs of using someone else's words as one's own.

5.2. Cheating is More Contingent on Contextual Factors than Plagiarism

Our findings also allow an inference that decisions to cheat are more contingent on the context than decisions to plagiarize. Students assessing the probability of getting punished as high are less likely to cheat, yet perceived costs (probability and severity of punishment) do not play a significant role in plagiarism behavior. At the same time, the frequency of plagiarism varies significantly across the institutions, but no such relationship is observed for cheating behavior. Otherwise speaking, cheating is more dependent on contextual factors and behavior of specific instructors, while plagiarism rates are rather conditioned institutionally.

International researchers tend to explain differences between colleges by such institutional characteristics as type, size, and academic integrity policies [Arnold, Martin, Bigby 2007; McCabe, Trevino, Butterfield 2002]. Differences in plagiarism rates among the four surveyed universities probably have to do with the types and efficiency of their prevention strategies. To shed more light on this issue, further research should involve a larger sample of colleges, so that relationship between their institutional characteristics and plagiarism rates could be better investigated.

Senior students of Russian colleges are more tolerant to academic dishonesty than freshmen [Chirikov, Shmeleva 2018; Denisova-Schmidt, Huber, Leontyeva 2016]. It may be suggested that students tend to engage in corrupt practices more and more often as they progress through college. The findings obtained herein do not allow saying whether it happens because of academic motivation decreasing over the period of studies or not, as different rounds used different instruments to measure motivation. What the findings do indicate is that contextual factors play a significant role in the prevalence of academic dishonesty—and thus may contribute to students tolerance towards academic dishonesty.

References

Ames C., Archer J. (1988) Achievement Goals in the Classroom: Students' Learning Strategies and Motivation Processes. *Journal of Educational Psychology*, vol. 80, no 3, pp. 260–267.

Anderman E. M., Koenka A. C. (2017) The Relation between Academic Motivation and Cheating. *Theory into Practice*, vol. 56, no 2, pp. 95–102.

Anderman E. M., Griesinger T., Westerfield G. (1998) Motivation and Cheating during Early Adolescence. *Journal of Educational Psychology*, vol. 90, no 1, pp. 84–93.

Arnold R., Martin, B. N., & Bigby, L. (2007). Is There a Relationship between Honor Codes and Academic Dishonesty? *Journal of College and Character*, vol. 3, no 2, pp. 1–20.

Broeckelman-Post M.A. (2008) Faculty and Student Classroom Influences on Academic Dishonesty. IEEE *Transactions on Education*, vol. 51, no 2, pp. 206–211.

Chirikov I. Shmeleva E. (2018) Are Russian Students Becoming More Dishonest During College? *Higher Education in Russia and Beyond*, vol. 3, no 17, pp. 19–21.

David L. T. (2015) Academic Cheating in College Students: Relations among Personal Values, Self-Esteem and Mastery. *Procedia—Social and Behavioral Sciences*, no 187, pp. 88–92.

Denisova-Schmidt E. (2018) Corruption, the Lack of Academic Integrity and Other Ethical Issues in Higher Education: What Can Be Done Within the Bologna Process? *European Higher Education Area: The Impact of Past and Future Policies* (eds A. Curaj, L. Deca, R. Pricopie), Springer, Cham, pp. 61–75.

Denisova-Schmidt E., Huber M., Leontyeva E. (2016) On the Development of Students' Attitudes towards Corruption and Cheating in Russian Universities. *European Journal of Higher Education*, vol. 6, no 2, pp. 128–143.

Denisova-Schmidt E. (2017) *The Challenges of Academic Integrity in Higher Education: Current Trends and Prospects*. The Boston College Center for International Higher Education (CIHE) Perspectives. No 5.

Dey E. L. (1997) Working with Low Survey Response Rates: The Efficacy of Weighting Adjustments. *Research in Higher Education*, vol. 38, no 2, pp. 215–227.

Elliot A.J. (2005) A Conceptual History of the Achievement Goal Construct. *Handbook of Competence and Motivation*, vol. 16, pp. 52–72.

Freiburger T. L., Romain D. M., Randol B. M., Marcum C. D. (2017) Cheating Behaviors among Undergraduate College Students: Results from a Factorial Survey. *Journal of Criminal Justice Education*, vol. 28, no 2, pp. 222–247.

Gizhitsky V. (2014) Uchebny obman kak strategiya psevdoadaptivnogo povedeniya u starsheklassnikov [Cheating as Maladaptive Behavior Strategy of High School Students]. *Scientific Notes of Orel State University. Series «Humanities and Social Sciences»*, no 2, pp. 293–299.

Gizhitsky V., Gordeeva T. (2015) Strategii uchebnogo povedeniya kak mediatory vliyaniya motivov na akademicheskie dostizheniya [Academic Behavior Strategies as Mediators of Motives' Influencing the Academic Achievement]. *Scientific Notes of Orel State University. Series «Humanities and Social Sciences»*, no 2, pp. 253–259.

Gordeeva T, Sychev O., Osin E. (2014) Oprosnik «Shkaly akadimicheskoy motivatsii» ["Academic Motivation Scales" Questionnaire]. *Psychological Journal*, no 4, pp. 96–107.

Golunov S. (2013) *Malpractices in the Russian Higher Education System: Implications for* EU-*Russian Education and Science Cooperation*. Centre for EU-Russia Studies EU-Russia paper No 9. Tartu: University of Tartu.

Jordan A. E. (2001) College Student Cheating: The Role of Motivation, Perceived Norms, Attitudes, and Knowledge of Institutional Policy. *Ethics & Behavior*, vol. 11, no 3, pp. 233–247.

Koul R. (2012) Multiple Motivational Goals, Values, and Willingness to Cheat. *International Journal of Educational Research*, vol. 56, pp. 1–9.

Latova N., Latov Y. (2007) Obman v uchebnom protsesse (opyt shpargalkologii) [Academic Dishonesty (A Study of Cheating Behavior]. *Social Sciences and Contemporary World*, no 1, pp. 31–46.

Leont'eva E. (2010) Standarty i realnost: mozhno li v rossiyskikh vuzakh uchit'sya po pravilam? [Standards and Reality: Is It Possible to Study in Russian Universities if You Follow the Rules?]. *Voprosy obrazovaniya / Educational Studies Moscow*, no 1, pp. 208–224.

Lupton R. A., Chaqman K. J. (2002) Russian and American college Students' Attitudes, Perceptions and Tendencies towards Cheating. *Educational Research*, vol. 44, no 1, pp. 17–27.

Ma Y., McCabe D.L., Liu R. (2013) Students' Academic Cheating in Chinese Universities: Prevalence, Influencing Factors, and Proposed Action. *Journal of Academic Ethics*, vol. 11, no 3, pp. 169–184.

Magnus J. R., Polterovich V. M., Danilov D. L., Savvateev A. V. (2002) Tolerance of Cheating: An Analysis across Countries. *The Journal of Economic Education*, vol. 33, no 2, pp. 125–135.

McCabe D.L., Feghali T., Abdallah H. (2008) Academic Dishonesty in the Middle East: Individual and Contextual Factors. *Research in Higher Education*, vol. 49, no 5, pp. 451–467.

McCabe D.L., Trevino L. K., Butterfield K. D. (2001) Dishonesty in Academic Environments. *Journal of Higher Education*, vol. 72, no 1, pp. 29–45.

McCabe D.L., Trevino L. K., Butterfield K. D. (2002) Honor Codes and Other Contextual Influences on Academic Integrity: A Replication and Extension to Modified Honor Code Settings. *Research in Higher Education*, vol. 43, no 3, pp. 357–378.

Maloshonok N. (2016) Kak vospriyatie akademicheskoy chestnosti sredy universiteta vzaimosvyazano so studencheskoy vovlechennostyu: vozmozhnosti kontseptualizatsii i empiricheskogo izucheniya [How Perception of Academic Honesty at the University Linked with Student Engagement: Conceptualization and Empirical Research Opportunities]. *Voprosy obrazovaniya / Educational Studies Moscow*, no 1, pp. 35–60. DOI: 10.17323/1814–9545–2016–1–35–60

Maloshonok N., Semenova T., Terentyev E. (2015) Uchebnaya motivatsiya studentov rossiyskikh vuzov: vozmozhnosti teoreticheskogo osmysleniya [Academic Motivation among Students of Russian Higher Education Establishments: Introspection]. *Voprosy obrazovaniya / Educational Studies Moscow*, no 3, pp. 92–121. DOI: 10.17323/1814–9545–2015–3–92–121

Megehee C. M., Spake D. F. (2008) The Impact of Perceived Peer Behavior, Probable Detection and Punishment Severity on Student Cheating Behavior. *Marketing Education Review*, vol. 18, no 2, pp. 5–19.

Murdock T. B., Anderman E. M. (2006) Motivational Perspectives on Student Cheating: Toward an Integrated Model of Academic Dishonesty. *Educational Psychologist*, vol. 41, no 3, pp. 129–145.

Murdock T. B., Hale N. M., Weber M. J. (2001) Predictors of Cheating among Early Adolescents: Academic and Social Motivations. *Contemporary Educational Psychology*, vol. 26, no 1, pp. 96–115.

Newstead S. E., Franklyn-Stokes A., Armstead P. (1996) Individual Differences in Student Cheating. *Journal of Educational Psychology*, vol. 88, no 2, pp. 229–241.

Ozdemir Oz A., Lane J. F., Michou A. (2016) Autonomous and Controlling Reasons Underlying Achievement Goals during Task Engagement: Their Relation to Intrinsic Motivation and Cheating. *Educational Psychology*, vol. 36, no 7, pp. 1160–1172.

Passow H. J., Mayhew M. J., Finelli C. J., Harding T. S., Carpenter D. D. (2006) Factors Influencing Engineering Students' Decisions to Cheat by Type of Assessment. *Research in Higher Education*, vol. 47, no 6, pp. 643–684.

Pavela G. (1997) Applying the Power of Association on Campus: A Model Code of Academic Integrity. *Journal of College and University Law*, vol. 24, no 1, pp. 97–118.

Poltorak Y. (1995) Cheating Behavior among Students of Four Moscow Institutes. *Higher Education*, vol. 30, no 2, pp. 225–246.

Rettinger D. A., Jordan A. E. (2005) The Relations among Religion, Motivation, and College Cheating: A Natural Experiment. *Ethics & Behavior*, vol. 15, no 2, pp. 107–129.

Rettinger D. A., Jordan A. E., Peschiera F. (2004) Evaluating the Motivation of Other Students to Cheat: A Vignette Experiment. *Research in Higher Education*, vol. 45, no 8, pp. 873–890.

Roshchina Y., Shmeleva E. (2016) Prepodavateli i studenty vuzov: obrazovatelnye i trudovye strategii v 2014 g. [University Teachers and Students: Educational and Labor Strategies in 2014]. *Monitoring of Education Markets and Organizations*, iss. 6 (95), Moscow: National Research University Higher School of Economics.

Ryan R. M., Deci E. L. (2000) Self-Determination Theory and the Facilitation of Intrinsic Motivation, Social Development, and Well-Being. *American Psychologist*, vol. 55, no 1, pp. 68–78.

Porter S. R., Whitcomb M. E. (2005) Non-Response in Student Surveys: The Role of Demographics, Engagement and Personality. *Research in Higher Education*, vol. 46, no 2, pp. 127–152.

Sheldon K. M., Osin E. N., Gordeeva T. O., Suchkov D. D., Sychev O. A. (2017) Evaluating the Dimensionality of Self-Determination Theory's Relative Autonomy Continuum. *Personality and Social Psychology Bulletin*, vol. 43, no 9, pp. 1215–1238.

Shmeleva E. (2015) Akademicheskoe moshennichestvo v sovremennykh universitetakh: obzor teoreticheskikh podkhodov i rezultatov empiricheskikh issledovaniy [Academic Dishonesty in Modern Universities: A Review of Theoretical Approaches and Empirical Findings]. *Economic Sociology*, vol. 16, no 2, p. 55–79.

Shmeleva E. (2016) Plagiat i spisyvanie v rossiyskikh vuzakh: rol' obrazovatel'noy sredy i individual'nykh kharakteristik studenta [Plagiarism and Cheating in Russian Universities: The Role of the Learning Environment and Personal Characteristics of Students]. *Voprosy obrazovaniya / Educational Studies Moscow*, no 1, pp. 84–109. DOI: 10.17323/1814–9545–2016–1–84–109

Simon C. A., Carr J. R., McCullough S.M., Morgan S. J., Oleson T., Ressel M. (2004) Gender, Student Perceptions, Institutional Commitments and Academic Dishonesty: Who Reports in Academic Dishonesty Cases? *Assessment and Evaluation in Higher Education*, vol. 29, no 1, pp. 75–90.

Terentyev E., Gruzdev I., Gorbunova E. (2015) Sud idet: diskurs prepodavateley ob otseve studentov [The Court Is Now in Session: Professor Discourse on Student Attrition]. *Voprosy obrazovaniya / Educational Studies Moscow*, no 2, pp. 129–151

Vallerand R. J., Pelletier L. G., Blais M. R., Briere N. M., Senecal C., Vallieres E. F. (1992) The Academic Motivation Scale: A Measure of Intrinsic, Extrinsic, and Amotivation in Education. *Educational and Psychological Measurement*, vol. 52, no 4, pp. 1003–1017.

Vansteenkiste M., Smeets S., Soenens B., Lens W., Matos L., Deci E. L. (2010) Autonomous and Controlled Regulation of Performance-Approach Goals: Their Relations to Perfectionism and Educational Outcomes. *Motivation and Emotion*, vol. 34, no 4, pp. 333–353.

Yu H., Glanzer P. L., Sriram R., Johnson B. R., Moore B. (2016) What Contributes to College Students' Cheating? A Study of Individual Factors. *Ethics & Behavior*, vol. 27, no 5, pp. 401–422.

Appendix

Table A1. **Examples of Indicators Used to Measure Academic Motivation, Broken Down by Types of Motivation and Scales**

Type of Motivation	Example of Indicator from the First-Round Instrument	Example of Indicator from the Second-Round Instrument
Intrinsic cognition	Attending a college, I will learn something new about the things I am interested in	I am interested in learning
Achievement motivation		I enjoy learning and solving challenging problems
Personal growth		For the pleasure of outperforming myself academically
Motivation for self-respect	I expect to obtain the knowledge and skills required for work as a result of my college studies	
Integrated motivation		Because I want to prove myself that I am capable of achieving academic success
Introjected motivation	I went to college to avoid disapproval of my friends and relatives	Because learning is my responsibility which I cannot abdicate
External motivation	It is only with a college degree that I will be able to find a high-paying job	I have no other choice, as student attendance is monitored
Amotivation	I have never reflected on why I go to college	To tell the truth, I don't know. It seems to me that I am just losing my time here

Table **A2. Internal Consistency of Indicators Measuring Different Types of Academic Motivation**

Type of Motivation	n	Cronbach's α
1st Round		
Intrinsic cognition	902	0.50
Motivation for self-respect	905	0.79
Introjected motivation	884	0.61
External motivation	882	0.83
Amotivation	888	0.74
2 nd Round		
Intrinsic cognition	903	0.75
Achievement motivation	903	0.88
Personal growth	903	0.71
Introjected motivation	903	0.82
External motivation	903	0.77
Amotivation	903	0.80

Table A3. **Ordinal Logistic Regression Results. Dependent Variable: Copying Fragments from Others Without Proper Citation** (n = 566)

Variable	Model 1	Model 2	Model 3
Academic motivation (relative autonomy scales)			
Academic motivation (1st round)	0.971 (0.029)	1.008 (0.032)	1.001 (0.032)
Academic motivation (2nd round)	0.780*** (0.070)	0.844* (0.081)	0.937 (0.093)
Control variables—individual student characteristics			
Gender (base: female)		0.822 (0.152)	0.830 (0.160)
Mother's education (base: college degree)		1.091 (0.228)	1.095 (0.238)
University 2 (base: university 1)		3.261*** (1.060)	2.463*** (0.853)
University 3		2.843*** (0.619)	2.404*** (0.561)
University 4		3.422*** (0.963)	2.451*** (0.752)
STEM (base: humanities and social sciences)		0.951 (0.212)	0.934 (0.215)
Self-funding or apprenticeship contract (base: state funding)		1.493** (0.298)	1.534** (0.317)
A's and B's (base: straight A's)		1.866** (0.572)	1.955** (0.618)
A's, B's, and C's		1.736* (0.557)	1.735* (0.575)
Mostly C's		2.463** (0.981)	2.513** (1.037)
Copying fragments from others without proper citation is not tolerated by the university (base: it is acceptable to copy fragments without citation or I don't know) (1st year)		0.463*** (0.137)	0.652 (0.205)
Perceived costs associated with contextual factors			
Most students use fragments from other publications or books without citing the source (base: no one or some students)			2.226*** (0.407)
Everyone uses fragments from other publications or books without citing the source (base: no one or some students)			8.640*** (2.899)
Moderate probability of getting bad grades in case plagiarism is detected (base: low probability)			1.328 (0.699)
High probability of getting bad grades in case plagiarism is detected (base: low probability)			1.026 (0.554)

Variable	Model 1	Model 2	Model 3
Moderate probability of instructors checking assignments for plagiarism (base: low probability)			1.040 (0.317)
High probability of instructors checking assignments for plagiarism (base: low probability)			0.903 (0.295)
Chi-squared	10.46	78.19***	136.62***
Number of factors extracted	4	15	21
Akaike Information Criterion (AIC)	1,162.7	1,117.0	1,070.5
Bayesian Information Criterion (BIC)	1,180.1	1,182.1	1,161.6
McFadden's pseudo R-squared	0.009	0.067	0.117

*** significance level = 0.001; ** significance level = 0.01; * significance level = 0.05.

Table A4. **Ordinal Logistic Regression Results. Dependent Variable: Using Cheat Sheets on an Exam/Test** (n = 638)

Variable	Model 1	Model 2	Model 3
Academic motivation (relative autonomy scales)			
Academic motivation (1st round)	0.977 (0.027)	0.992 (0.029)	0.986 (0.030)
Academic motivation (2nd round)	0.665*** (0.057)	0.725*** (0.065)	0.876 (0.084)
Control variables — individual student characteristics			
Gender (base: female)		0.836 (0.151)	0.926 (0.177)
Mother's education (base: college degree)		0.748 (0.152)	0.905 (0.192)
University 2 (base: university 1)		1.845** (0.527)	1.299 (0.392)
University 3		1.401 (0.299)	1.235 (0.278)
University 4		0.952 (0.263)	0.725 (0.211)
STEM (base: humanities and social sciences)		0.786 (0.171)	0.841 (0.191)
Self-funding or apprenticeship contract (base: state funding)		0.727 (0.146)	0.608** (0.130)
A's and B's (base: straight A's)		1.670* (0.480)	1.978** (0.607)
A's, B's, and C's		1.585 (0.479)	1.884** (0.608)

Variable	Model 1	Model 2	Model 3
Mostly C's		3.862*** (1.445)	4.884*** (1.925)
Cheating during an exam/test (base: *acceptable* or *I don't know*) (1st year)		0.567*** (0.118)	0.687* (0.150)
Perceived costs associated with contextual factors			
Most students use cheat sheets or copy from other students during exams or tests (base: *no one* or *some students*)			5.487*** (1.042)
Everyone uses cheat sheets or copies from other students during exams or tests (base: *no one* or *some students*)			6.787*** (2.366)
Moderate probability of instructors removing a student cheating during an exam/test from the classroom (base: low probability)			0.377** (0.152)
High probability of instructors removing a student cheating during an exam/test from the classroom (base: low probability)			0.336*** (0.128)
Chi-squared	27.12	69.44***	177.65***
Number of degrees of freedom	4	15	19
Akaike Information Criterion (AIC)	1,185.4	1,165.1	1,064.9
Bayesian Information Criterion (BIC)	1,203.2	1,232.0	1,149.6
McFadden's pseudo R-squared	0.023	0.058	0.148

*** significance level = 0.001; ** significance level = 0.01; * significance level = 0.05.

The Method of League Analysis and Its Application in Comparing Global University Rankings and Russia's University Performance Monitoring

Authors

Vladimir Navodnov
Doctor of Sciences in Engineering, Professor, Director of the National Centre for Public Accreditation. Address: 206a Volkova Str., 424000 Yoshkar-Ola, Mari-El Republic, Russian Federation. E-mail: director@ncpa.ru

Galina Motova
Doctor of Sciences in Pedagogy, Deputy Director of the National Centre for Public Accreditation. Address: 206a Volkova Str., 424000 Yoshkar-Ola, Mari-El Republic, Russian Federation. E-mail: g.motova@ncpa.ru

Olga Ryzhakova
Graduate Student, Department of Applied Mathematics and Information Technology, the Volga State University of Technology. Address: 3 Lenina Sq., 424000 Yoshkar-Ola, Mari-El Republic, Russian Federation. E-mail: olgaryzh@yandex.ru

Abstract

A new technique called Method of Analysis of Leagues (MethALeague) is proposed for comparing performance of higher education institutions measured by different assessment methods. The MethALeague uses the convolution operations from the theory of small-group decision making to create aggregate charts of university leagues based on the performance indicators obtained with different assessment techniques. Specifically, researchers are given the opportunity to bring widely divergent university performance indicators into unified assessment charts and carry out comparative analysis of different assessment approaches. The MethALeague was applied successfully to compare the performance indicators of the Project 5–100 universities reflected in three major global rankings, Academic Ranking of World Universities, QS World University Rankings, and Times Higher Education World University Rankings. A formalized concept of "world ranking" proposed in the article makes it possible to visualize the performance dynamics of Russia's top universities and compare it to that of the top universities in other countries (United States, Great Britain, Australia, Germany, and China). Suggestions are made on using a modified version of the MethALeague at the national level to analyze the results of university performance monitoring and compare them to the universities' global ranking positions. The method described in the article could be applied by educational authorities, researchers and higher education institutions to determine the frameworks of strategic development, both for specific universities and for Russia's higher education system as a whole.

Keywords

higher education institutions, global rankings, performance monitoring, convolution operations, the Borda count method, Method of Analysis of Leagues (MethALeague), ranking.

References

Alden J., Lin G. (2004) *Benchmarking the Characteristics of a World Class University: Developing an International Strategy at University Level*. London: The UK Higher Education Leadership Foundation.

Arzhanova I., Baryshnikova M., Zhurakovsky V. et al. (2013) Modelnaya metodologiya mnogomernogo ranzhirovaniya rossiyskikh vusov [Template Meth-

odology of Russian Heis Multidimensional Ranking]. *International Organizations Research Journal*, vol. 8, no 1.

Bozhuk S., Kovalik L. (2004) *Marketingovye issledovaniya* [Marketing Research]. St. Petersburg: Piter.

Fatkhutdinov R. (2006) Upravlenie konkurentosposobnostyu vuza [Management of University Competitiveness]. *Vysshee obrazovanie v Rossii [Higher Education in Russia],* no 9, pp. 35–37.

Filinov N. B., Ruchkina S. (2002) Ranking of Higher Education Institutions in Russia: Some Methodological Problems. *Higher Education in Europe*, vol. 27, no 4, pp. 407–421.

Harvey L. (2008) Rankings of Higher Education Institutions: A Critical Review. *Quality in Higher Education*, vol. 14, iss. 3, pp. 187–207.

Hou Y. W., Jacob W. J. (2017) What Contributes More to the Ranking of Higher Education Institutions? A Comparison of Three World University Rankings. *International Education Journal: Comparative Perspectives*, vol. 16, no 4, pp. 29–46.

Kusumastuti D., Idrus N. (2017) Nurturing Quality of Higher Education through National Ranking: A Potential Empowerment Model for Developing Countries. *Quality in Higher Education*, vol. 23, iss. 3, pp. 230–248.

Larichev O. (2000) *Teoriya i metody prinyatiya resheniy, a takzhe Khronika sobytiy v Volshebnykh Stranakh: uchebnik* [Theory and Methods of Decision Making, and The Chronicles of Fairy Lands: A Textbook]. Moscow: Logos.

Larionova M. (2012) Metodologiya sravnitelnogo analiza mezhdunarodnykh podkhodov ranzhirovaniya vysshikh uchebnykh zavedeniy [Analysis Methods for Comparing Different World University Ranking Methodologies]. *Vestnik Mezhdunarodnykh Organizatsiy: Obrazovanie, Nauka, Novaya Ekonomika [International Organizations Research Journal: Education, Science, and the New Economy]*, vol. 7, no 1, pp. 34–69.

Levin H., Jeong D. W., On D. (2007) *What is a World Class University?* Paper Prepared for the 2006 Conference of the Comparative & International Education Society. Available at: www.tc.columbia.edu/centers/ coce/pdf files/c12.pdf (accessed 1 August 2019).

Motova G., Navodnov V. (2018) Ot institutionalnoy akkreditatsii k monitoring effektivnosti [From Institutional Accreditation to Monitoring of Effectiveness]. *Vysshee obrazovanie v Rossii (Higher Education in Russia)*, vol. 27, no 4, pp. 9–21.

Navodnov V., Motova G., Kuzminykh Z., Krasilnikova N. (2012) *Reytingi vuzov: globalnye i natsionalnye. Uchebno-metodicheskie materialy k seminaru* [University Rankings: Global and National Scales. Teaching Aids for Group Discussion]. Yoshkar-Ola: Training and Consultancy Center.

Navodnov V., Ryzhakova O. (2018) Obobshchenie modeli McKinsey dlya ranzhirovaniya obrazovatelnykh organizatsiy vysshego obrazovaniya s ravnoznachnymi kriteriyami [Generalization of the McKinsey Model to Rank Higher Educational Institutions with Equal Criteria]. *Vestnik of Volga State University of Technology. (Economics and management)*, no 2 (38), pp. 5–18. doi: 10.15350/2306-2800.2018.2.5.

Petrovsky A. (2009*) Teoriya prinyatiya resheniy* [Decision Theory]. Moscow: Akademiya.

Polikhina N., Trostyanskaya I. (2018) *Reytingi universitetov: tendentsii razvitiya, metodologiya izmeneniya* [University Rankings: Development Trends and the Methodology of Change]. Moscow: Federal State Autonomous Scientific Institution Center for Sociological Research ("Sociocenter").

Prokhorov S., Svirina A., Chekhonadskikh A. (2016) Monitoring effektivnosti: instrument sokrashcheniya ili poisk tochek rosta? [Efficiency Monitoring: An

Instrument for Reduction or an Engine for Growth?]. *Vysshee obrazovanie v Rossii (Higher Education in Russia)*, no. 1 (197), pp. 63–68.

Rauhvargers A. (2011) *Global University Rankings and Their Impact*. Brussels: European University Association.

Salmi J. (2009) *The Challenge of Establishing World-Class Universities*. Washington: The International Bank for Reconstruction and Development.

Salmi J. (2016) *Excellence Strategies and the Creation of World-class Universities. Matching and Perfomance*. Rotterdam: Sense Publishers. P. 15–48.

Salmi J., Froumin I. (2013) Kak gosudarstva dobivayutsya mezhdunarodnoy konkurentosposobnosti universitetov: uroki dlya Rossii [Excellence Initiatives to Establish World-Class Universities: Evaluation of Recent Experiences]. *Voprosy obrazovaniya/Educational Studies Moscow*, no 1, pp. 25–68.

Shehatta I., Khalid M. (2016) Correlation among Top 100 Universities in the Major Six Global Rankings: Policy Implications. *Scientometrics*, vol. 109, iss. 2, pp. 1231–1254.

Tofallis C. (2012) A Different Approach to University Rankings. *Higher Education*, vol. 63, no 1, pp. 1–18.

Vildanov R., Navodnov V., Ryzhakova O. (2017) Sem' ottenkov monitoringa [Seven Shades of Monitoring]. *Akkreditatsiya v obrazovanii* [Accreditation in Education], no 94, pp. 64–73.

Zadorozhnyuk I., Korosteleva L., Tebiyev B. (2019) Top-200 vuzov v chetyrekh mezhdunarodnykh reitingakh [Top-200 Higher Education Institutions in Four International Ratings: Comparative Analysis]. *Vysshee obrazovanie v Rossii (Higher Education in Russia)*, vol. 28, no 3, pp. 85–95.

Comparison of Teaching Instruction Efficiency in Physics through the Invested Self-Perceived Mental Effort

Branka Radulović, Maja Stojanović

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Branka Radulović
PhD, Scientific Associate, University of Novi Sad, Faculty of Sciences, Department of Physics. E-mail: branka.radulovic@df.uns.ac.rs
Maja Stojanović
PhD, Full Professor, University of Novi Sad, Faculty of Sciences, Department of Physics. E-mail: maja.stojanovic@df.uns.ac.rs

Address: Trg Dositeja Obradovića Sq. 3, Novi Sad, Republic of Serbia.

Abstract. The main goal of the research is to determine how certain teaching instruction methods affect the achievement and mental efforts of high school students needed for learning Fluid Mechanics topic in Physics. Determining mental effort or cognitive load as a wider concept helps obtain important data, which can be used to identify teaching instruction menthods, which result in higher performance and motivation. This research is aimed to examine the efficiency of three approaches to teaching physics, which are most common in the Republic of Serbia. These are: an approach based on the use of laboratory inquiry-based experiments (LIBE), an approach based on the use of interactive computer-based simulation (ICBS) and a traditional teaching approach (TA). The article describes an experimental study conducted with two experimental and one control groups. The research was conducted on a sample of six high school classes in a gymnasium with advanced study in Natural Science and Mathematics in Novi Sad, Republic of Serbia. The total sample count was 187 students (mean age 16 years). The main conclusions of the research are that there is a causal link between the teaching instruction method applied and the achievement, or the self-perceived mental effort, of a student. Students, who were learning the teaching content through LIBE or ICS approach, have achieved better results in the knowledge test and estimatd their mental effort to be lower compared to the students, who were learning the same content through traditional teaching approach applied. The reasearch also showed, that LIBE or ICBS teaching approaches achieve higher levels of instructional efficiency and instructional involvement compared to the traditional teaching approach.
Key words: mental effort, instructional efficiency, instructional involvement, interactive computer-based simulation, laboratory inquiry-based experiments, Physics.

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Modern teaching methodology allows to overcome the traditional approach and to develop and promote new methods and ways of

teaching [Jackson, Dukerich, Hesnes 2008]. Teachers in the modern world aspire to achieve better results in transferring knowledge from a teacher to a student by implementing different teaching techniques, focusing on students' understanding of the basic concepts of physics, rather than just memorizing them [Stamenkovski, Zajkov 2014. P. 7]. The importance of searching for new methods and ways of teaching has been recognized as a global problem. Therefore, many countries have embarked on reforming national science education programs to include new teaching approaches that aim to achieve higher efficiency [NRC2000] (according to [Wang, Jou 2016. P. 212]). For this research the focus was to examine how application of laboratory inquiry-based experiments (LIBE), interactive computer-based simulations (ICBS) and traditional teaching (TA) approaches affect the achievement and self-perceived mental effort of high school students in their second year of study. These three approaches were chosen because they are commonly used for teaching Physics in the Republic of Serbia.

Traditional teaching approach is determined by the frontal form of instruction with the dominating role of the teacher taking on the lecturing function. The active role here is played by the teacher, not the student. The main disadvantages of the traditional teaching method are limitations set around teaching and learning individualization, as well as internal and external motivation of students. In this learning format students rarely receive feedback, which is an important contributor to student learning [Trees, Jackson 2007]. As a result, students' attention weakens quickly during lectures and information tends to be quickly forgotten [Schwerdt, Wuppermann 2011. P. 366]. Also, this approach is based on the presumption that all students learn at the same pace [Ibid.]. The active role of students in the learning process is neglected, and the student develops within the framework of educational objectives and their implementation, rather than within the framework of their own abilities. As a result, this approach is not seen as a very stimulating environment for learning. Therefore it is necessary to create a different teaching approach that will respect individual differences among students and provide them with a central role in the teaching process, which would be is designed to develop their abilities. When such new approach is created, it is necessary to examine its efficiency and compare it with the efficiency of other teaching approaches [Drakulić, Miljanović 2007; Odadžić et al. 2017; Radulović, Stojanović 2015; Radulović, Stojanović, Županec 2016; Županec, Miljanović, Pribićević 2013; Županec et al. 2018].

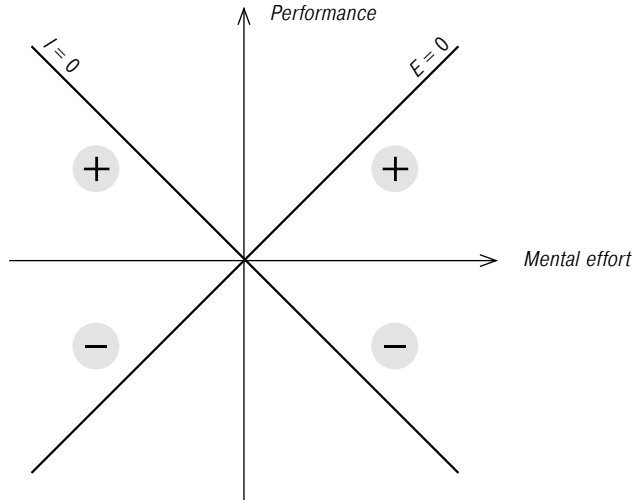
The LIBE teaching approach integrates the positive elements of the traditional approach around maintaining communication between the students and the teacher in order to increase active participation of students in the learning process and constantly monitoring their progress. The teaching process becomes clearer and more dynamic, increasing student motivation [Jarrett, Takacs, Ferry 2010; Vollmer, Möllmann 2011]. Inquiry-based learning, as a form of teaching ap-

proach which includes hands-on experiments in teaching physics, can be defined as a learning approach that mimics authentic scientific inquiry [Jaakkola, Nurmi 2008. P. 272). This teaching approach involves several activities: asking questions, generating testable hypotheses, making discoveries, and rigorously testing and evaluating the plausibility of those discoveries in search for new understanding [de Jong, 2006] (according to [Jaakkola, Nurmi 2008. P. 272]). The aim of this approach is to use actual scenarios as scientists and develop scientific knowledge and skills [Miller 1998] (according to [Wang, Jou 2016. P. 212]).

Multimedia represents a trend to enhance the teaching process by monitoring new developments in the industry and brinning them to the classroom. As the numerous studies [Bennett, Brennan 1996; Liu et al. 2017; Mayer 2001; Mayer et al. 1999; Muller 2008] have shown, using multimedia content or computer simulation as a cognitive tool can help improve students' conceptual understanding of physics. According to cognitive theory of multimedia learning, learning is facilitated when content is presented in verbal and non-verbal (graphic) format. Multiple representations of information can be used to encourage students to get actively involved in the learning process, directing their attention to relevant incoming information, thus further facilitating a coherent mental representation and integration of already acquired knowledge [Kostić 2006]. The recent emergence of computer simulations allows students to examine a wide range of scientific phenomena by manipulating variables that would not be easily accessible in physical experiments [de Jong, 2006] (according to [Kant, Scheiter, Oschatz 2017. P. 47]). The major criticism of the use of simulations in the educational process is that students learn in a different way than scientists in a real lab [Steinberg 2000] or that a simulation may oversimplify complex systems [Crook 1994] (according to [Jaakkola, Nurmi 2008. P. 273]. Because of that, this research aimed to compare — amonth other things — instructional efficiency and instructional involvement of ICBS and LIBE teaching approaches with instructional efficiency and instructional involvement of the traditional approach.

Another thing that can indicate additional benefits or effects of a teaching approach, is mental effort, i. e. cognitive load on the students caused by a certain approach. Cognitive load can be defined as a multidimensional construct representing the load that performs a particular task, imposed on the learner's cognitive system [Paas et al. 2003. P. 64]. There are three components of cognitive load: intrinsic, extraneous and germane [Carterette, Friedrnan 1996; de Jong 2010; Kalyuga 2008; 2009; Sweller, Ayres, Kalyuga 2011]. In order to evaluate certain teaching approach, it is necessary to observe the combination of these three components of the cognitive load together. If the combination of these three components of cognitive load is equal to the capacity of the working memory, then such teaching approach is beneficial for students [Radulović, Stojanović 2015]. If the combi-

Figure 1: **Graphical representation of instructional efficiency and instructional involvement based on standardized performance and mental effort** (adapted according to [Cerniglia 2012; Županec et al. 2018]).



nation goes beyond the limits of the working memory, such teaching approach is not beneficial for students. In this case, it is first necessary to try to reduce cognitive activities, which cause external load; if this is not enough, than it is necessary to reduce cognitive activities, which cause germane load [Ibid.]. There are a number of studies, which were looking for ways to manipulate the cognitive load [Homer, Plass 2010; Kirschner 2002; Lee, Plass, Homer 2006; Plass, Homer, Hayward 2009; van Merriënboer, Sweller 2005; Sweller, Chandler 1994; Sweller 1994]. One study [Lee, Plass, Homer 2006 described a method of manipulating the intrinsic cognitive load by presenting information in two rounds: first with low and then with higher complexity. This approach was also applied in our research.

In order to determine which teaching approach is more beneficial for students, we can calculate instructional efficiency and instructional involvement for a certain approach. The instructional efficiency and instructional involvement can be calculated by knowing the standardized value of mental effort and performance [Paas, van Merriënboer 1993; Paas et al 2005]. Positive values of instruction efficiency mean that a certaing teaching approach demonstrated higher standardized achievement and a smaller standardized mental effort. Along with determining the efficiency, cognitive load researchers need to determine the motivational effects of instructional conditions and identify strategies that keep students' attention focused on learning [Paas et al. 2005. P. 27]. Also, the researchers' task is to assist instructional

designers to recognize the power of authentic learning environments for enhancing the motivation of learners [Ibid.]. Figure 1 shows combined graphical interpretation of measured instructional efficiency and instructional involvement.

The upper part of the graph contains the positive values of the instructional efficiency and the instructional involvement, which represents the positive influence of a certain teaching method upon the mentioned aspects. Our research of teaching approaches to physics in the Republic of Serbia is mainly focused on teaching methods and student achievement, and we aim to introduce a new perspective to several factors, which can better explain the effects, that different teaching approaches may have on the learning process.

Problem of Research

The central goal of this research was to determine, how different teaching approaches to physics influence students' performance in learning high school topic of Fluid Mechanics and its subtopic of Properties of Liquid, as well as to determine how the teaching approach applied influences students' invested self-perceived mental effort. The Properties of Liquids is one of the four subtopics of Fluid Mechanics, studied in the second year of high school in the Republic of Serbia. And it was selected for conducting the experiment, described in this article. This subtopic has strong correlation between physics and chemistry, e. g. when studying physical and chemical properties of pure liquids (viscosity, vapor pressure, etc.). Therefore, understanding the basic concepts of this subtopic affects the understanding of the material from both physics and chemistry. Because of the complexity and importance of this subtopic, it is important to consider the best way to teach this content. Also, this content is focused on studying natural and technical sciences concepts, which further indicates the importance to look at different teaching approaches and determine, how they influence the levels of understanding and mental effort of students.

According to the central purpose, this research has three objectives:

1. Determine whether there is a difference between experimental (ICBS and LIBE) and control (TA) groups in terms of students' achievement on the post-test, depending on the applied teaching approach.
2. Determine whether there is a difference between experimental (ICBS and LIBE) and control (TA) groups in the students' invested self-perceived mental effort depending on the applied teaching approach.
3. Compare the efficiency and involvement for the instructional strategies studied.

Table 1. **Structure of the sample by gender and group.**

Gender/Group	LIBE	ICBS	TA
Male	41	30	32
Female	22	32	30
All	63	62	62

Methodology of Research

Sample of Research and Procedures

The research was conducted on a sample of six high school classes in a gymnasium with advanced study in Natural Science and Mathematics in Novi Sad, Republic of Serbia. The sample consisted of 187 students. To calculate of size sample, Raosoft application (http://www.raosoft.com/samplesize.html) was used. The maximum count of students is around 300. Using the application, the sample size for reaching confidence level of 95% was calculated to be 169 students, while for having the confidence level of 99% the sample size needed to be 207 students. Based to these results, it was assumed that the sample of 187 students is acceptable. Table 1 shows the structure of the sample by gender and group.

One group consists of two classes, therefore each group had nearly equal number of students (Table 1). Selecting a class that would form one group was done according to a prior agreement with Physics teachers, who teach in these schools, by determining, which teaching approaches were most commonly used for teaching their students. This ensured that students of experimental groups were familiar with the materials or videos from the previous teaching topics. Students in each class volunteered to participate in the research. Then they stayed in their own classes and participated in a group, which was assigned to the class. All students were informed of the research to be conducted. Students, who agreed to participate in the research, were required to attend all classes. Other students also attended the all classes but they did not pass the knowledge tests, held by the co-author of this research. Students were familized with the objectives of this research to prevent obstructions to this pedagogical experiment. Also, the school principal and Physics teacher in each school were familiarized with the purpose and objectives of the research.

The research included the Properties of Liquid subtopic of the high school curriculum, which consists of three parts: Viscosity in Liquids, Newton and Stokes law; Liquid Surface Tension and Capillary. Within the period of the experiment, 3 classes were given to students to analyze the teaching material, 2 classes were planned to repeat the content, and 2 classes planned for pre- and post-testing. Although this is a relatively small number of teaching units, the concepts related to the chosen field are first introduced to the students in the second grade

of the gymnasium. Based on their experience, physics teachers know that students often have difficulties understanding the concepts, introduced in this topic, and it is difficult for them to understand the correlations between these concepts.

After the students were divided into groups, the implementation of the pedagogical experiment with parallel groups started. Students of the control group were taught the content through the traditional teaching approach. This approach involved the use of the blackboard and chalk as teaching tools and strictly adhering the the curriculum as approved by the Ministry of Education. This group of students was taught by their usual school teacher in accordance with the instruction given by the co-author of this artilce, who taught in other groups. The co-author of this article attended all classes in order to answer any student questions if they had them.

Students in the LIBE experimental group used Physics equipment for hands-on experiment within LIBE teaching approach. The students were divided into groups of four students. Each group was given instructions by the teachers and the students themselves performed the experiments. Experiments were carried out during the class hours. After the experiment was made, the students wrote down their conclusions in their notebooks. Each group had the same measurement task, but they had different substances to measure. For example, the following liquids were used to measure the voscosity coefficient: water, oil, glycerol, and alcohol. Students measured the time of the free fall of the ball between two points through a viscous liquid, and based on that data determined the coefficient of viscosity. This allowed students to obtain different measurement results, which opened discussions of results and leading to understanding of liquid density and its influence on measurements results. In this way, students were able to conclude whether the coefficient of viscosity increases or decreases if there is an increase in the density or temperature of liquids. For the coefficient of surface tension students compared the value of the coefficient of surface tension and the diameter. Also, they experimented with a paper clip that needed to be placed on the surface of water, and what would happen if they put liquid soap into the water. After the discussion, the students drew conclusions about causal relationships between physical phenomena on their own.

The students of the ICBS experimental group were taught the content through simulations and multimedia content. The students were shown films and animations that are available on the Internet about phenomena, they were learning. Students watched a recording of an entire experiment, which demonstrated how coefficient of viscosity or coefficient of surface tension can be measured. Students were first given a film, where one liquid was used for determining a coefficient of viscosity, and then another film, where the same experiment was held with two parallel cylinders filled with different fluids. This way students were able to see the relationship between the density of the liquid and

the viscosity coefficient. Similar activities were done for all units. After each class the students discussed the correlations between physical phenomena, which they observed. In the ICBS group the teacher had a role of a narrator while students were watching films and animations; and during duscussions the teacher had the role of a coordinator. All units in experimental groups were taught by one teacher, co-author of this article. This allowed monitoring of the whole process of this pedagogical experiment and prevented contaminating the results by influence from another teacher's skills.

Instrument

The instruments which were designed and applied in this research were the pre-test and the post-test with given a Likert scale for determination of invested mental effort. At the beginning of the research, a pre-test was held in order to synchronize the level of previous knowledge students had. The tasks in pre-test were related to the 'Properties of Fluid Dynamics' topic, which was studied before the start of the experiment. Within this topic, the teaching units related to the equation of continuity and the Bernoulli equation. The terms defined in this topic are important for understanding terms, such as viscosity, which is studied in the 'Properties of Liquid' subtopic. According to the approved curriculum, high school students in the Republic of Serbia for the first time study concepts viscosity, surface tension and capillary phenomena within the second year of high school. Therefore pre-test tasks were related to the previous topic 'Properties of Fluid Dynamics'. The pre-test contained 20 tasks of multiple choices type. Each correctly solved task in the pre-test was scored with one point. Therefore, the maximum possible achievement on the pre-test was 20 points. After pre-testing, the 'Properties of Liquid' subtopic was taught with different teaching approaches.

In order to determine the influence of different teaching approach, students were given a post-test after finishing all units within the subtopic. The post-test contained 20 tasks of multiple choice type. Each correctly solved task in the post-test was scored one point. Therefore, the maximum possible achievement on the post-test was 20 points. The tasks in post-test were related to 'Properties of Liquid' subtopic. Within each task of the post-test the Likert scale was given, in which students had to rate the difficulty of the task subjectively, in other words how much mental effort they invested in solving of each tasks, by selecting a number on a scale ranging from 1 (very easy) to 5 (very difficult). For this research, mental effort was determined using the self-assessment method. This method belongs to a group of empirical indirect subjective measures. Within this method, students themselves evaluate how much mental effort they have invested in learning, based on a given scale (de Jong, 2010). There are different scales, and for this research a scale of 1 to 5 was selected because it is the same as the scale in the elementary and the secondary school in the

Republic of Serbia, from 1 (insufficient) to 5 (excellent). Pre- and post-tests in all groups were done at the same time. The tasks for pre- and post-test were positively reviewed by three university professors who are specialized in the studied areas of physics and three school teachers in the Republic of Serbia. Tasks of the post-test did not containe any questions about experiments. Examples of several tasks from the post-test are presented in Appendix 1. The applied measuring instruments indicated satisfactory metric characteristics. Cronbach α coefficient for pre-test was 0.936, post-test was 0.975 and for invested mental effort 0.867. Each value is higher than 0.7, which is a limit for acceptable internal consistency. The research was conducted in Novi Sad in February 2012.

Data Analysis

The following analyzes were applied in order to determine how applied teaching approach influence students' achievement and mental effort: ANOVA, Scheffe's post-hoc test and Chi-squeare test. For measurement the value of impact for ANOVA eta-square was calculated and for Chi-square test Cramer's V was calculated. All analyses were conducted in SPSS20 and Excel.

Results of Research

Results of students' achievement on pre-test are shown in Table 2. ANOVA showed that there was no significant difference between groups on pre-test $F (df = 2, N = 184) = 0.42$, $p = 0.66$.

Based on this result, the groups were considered uniform. After the pre-test, the pedagogical experiment with parallel groups started. After pedagogical experiment, final measuring was conducted. On post-test ANOVA showed that there is a significant difference between groups: $F (df = 2, N = 184) = 14.89$; $p = 0.001$, $\eta 2 = 0.14$. Table 3 shows statistical data that describe student achievement on the post-test.

The value of eta-square indicated a large impact each applied teaching approach had on students' achievement on post-test. In order to note the difference among groups more clearly, Scheffe's test was applied. Using Scheffe posthoc test, it was proved that mean value for the TA group ($M = 11.06$, $SD = 2.64$) is significantly different than the mean value for experimental groups LIBE ($p = 0.000$) and ICBS ($p = 0.000$), in favor of experimental groups. Also, it is noted that the mean value for LIBE group ($M = 13.29$, $SD = 2.85$) is significantly different than the mean value for the TA group ($p = 0.000$), but not for the ICBS group ($p = 0.826$). The t-test of paired samples estimated the contribution of each approach on student achievement. The results showed increasing student achievement in the experimental groups LIBE and ICBS.

Chi-sqaure test did not show statistical difference between boys and girls on achievement on post-test, $\chi^2 (df = 2, N = 187) = 3.014$, $p = 0.222$, $V = 0.127$. Although the difference was not statistically sig-

Table 2. **Statistical parameter for students' achievement on pre-test.**

Group	M	SD	Range	Skewness	Kurtosis
TA	10.90	3.08	14.0	–3.571	2.915
LIBEs	10.49	3.09	12.0	–0.765	–1.194
ICBSs	10.90	2.48	10.0	–1.237	–0.303

Table 3. **Statistical parameter for students' achievement on the post-test.**

Group	M	SD	Range	Skewness	Kurtosis
TA	11.06	2.64	11.0	0.731	–0.676
LIBEs	13.29	2.85	12.0	–0.380	–0.887
ICBSs	13.02	2.12	10.0	–0.105	–0.682

Table 4. **The self-perceived mental effort of students.**

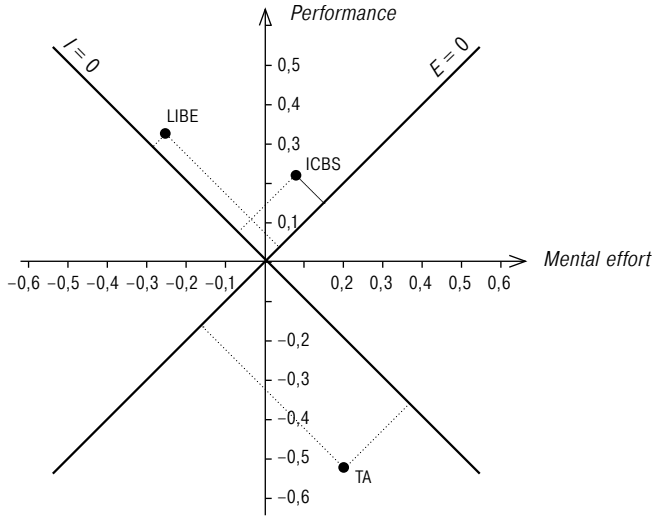
	Mental Effort		Range	Skewness	Kurtosis			
Group	M	SD				χ^2	p	V
TA	3.52	0.78	3.8	–0.499	0.959	11.422	0.179	0.247
LIBEs	3.22	0.46	2.5	–0.183	0.547			
ICBSs	3.43	0.55	2.8	0.650	0.837			

nificance, it was concluded that boys show higher achievement (M = 12.70, SD = 2.72) than girls (M = 12.12, SD = 2.74).

In Table 4 students' self-perceived mental effort caused by teaching approach is presented. ANOVA shows that there is statistically significant difference of self-perceived mental effort of three teaching approaches: $F(2, 184) = 3.592$; $p = 0.029$, $\eta 2 = 0.04$. The value of eta-square indicated the small or medium impact of applied teaching approach on students' invested self-perceived mental effort.

Scheffe's test showed that mean value of self-perceived mental effort of students from TA group (M = 3.51, SD = 0.78) and mean values of perceived mental effort of students from LIBE group (M = 3.22, SD = 0.46) are significantly different (p = 0.000). Also, the mean value of perceived mental effort of students from ICBS group (M = 3.43, SD = 0.55) is not significantly different than TA group (p = 0.227), but it is compated to students from LIBE group (p = 0.000). So, it can be seen that students from LIBE group invested smaller effort than stu-

Figure **2: Graphical determination of instructional efficiency and instructional involvement for each of the teaching approaches applied.**



dents form ICBS or TA group. Cramer's V indicated the medium impact of applied teaching approach on perceiving mental effort.

Chi-sqaure test did not show statistical difference between boys and girls on invested self-perceived mental effort on post-test, χ^2 (df = 4, N = 185) = 6.179, p = 0.186, V = 0.183. Although the difference was not statistically significance it was concluded, that boys perceive lower mental effort (M = 3.38, SD = 0.65) to be lower than girls (M = 3.40, SD = 0.59).

Figure 2 shows instructional efficiency and instructional involvement for each of the teaching approaches applied.

According to obtained values for standardized performances and standardized self-perceived mental effort, the efficiency of teaching instructions can be graphically presented. The efficiency of traditional teaching approach is ETA = –0.52, while the value of involvement is ITA = –0.23. For experimental LIBE group, efficiency is ELIBE = 0.40, while the involvement is ILIBE = 0.04, and for experimental ICBS group, efficiency is EICBS = 0.10 and involvement is IICBS = 0.20.

Obtained values showed that teaching approach which uses ICBS or LIBE methods is more efficient than traditional teaching approach. These two approaches are more acceptable for students because they require less mental effort and result in higher achievement.

Discussion

In this research, the influence of teaching approaches in Physics on students' achievement and self-perceive mental effort is determined. It examines three teaching approaches: using laboratory inquiry-based experiments (LIBE) or interactive computer-based simulations (ICBS) and traditional teaching approach, which are commonly used in the Republic of Serbia. The authors held a significant experiment to research instructional efficiency and instructional involvement of each teaching approach in order to present the school teachers with the results of the research. The results are divided into three parts.

The first part of the research was related to determining influence each of teaching approaches applied has on students' achievement. The results show that students, taught through LIBE or ICBS methods, achieve a higher score on knowledge test compared to students, taught through traditional method. These results indicate that teaching approach, where sudents have an active role, has positive effects on students' achievement. Similar results were obtained in research, conducted by Radulović, Stojanović and Županec [2016]. The explanation for this results is based on the conception of the science itself and accelerated technical-technological development of the society. Physics is based on experiments. Therefore, it is easier for students to be presented with a practical case. Hands-on experiments are generally argued as important as part of science education, especially in physics education [Abrahams, Millar 2008; Johnstone, Al-Shuaili 2001; Zacharia 2003].

According to Zacharia, Redish and Wilson, simulations are recognized as a very effective learning activity that can recreate the environment and practical examples, which necessary for the development of insight about abstract physics concepts [Zacharia, Anderson 2003]. Some researchers [Kuhn, Vogt 2013; Stamenkovski, Zajkov 2014; Zajkov, Mitrevski 2012] argue the benefits of real experiments and possibilities, offered by multimedia or specific devices (such as smartphones) as experimental tools in combination with computers. The application of computer skills in teaching gives better result for understanding of some phenomena, for which students do not necessarily need to deal with the real experimental tools [Ajredini, Zajkov, Mahmudi 2012]. Students, which learn through simulations, do not have to spend time on the preparational activities related to laboratory work and problems related to technical tools [Ibid.], thus they can spend more time on thinking, analyzing and discussing [Ajredini, Izairi, Zajkov 2014]. According to the results of researches, held by Ajredini, Izairi and Zajkov [2014] and Stamenkovski and Zajkov [2014], there is no significant difference between the knowledge, acquired through learning supported by real experiments, and the knowledge, acquired through learning, supported by computer simulated experiments. This conclusion is positively reinforced by results of our research. The Scheffe post-hoc test in our research did not show a significant difference between students' achievement in ICBS and LIBE

groups. One of the limitations of our research is related to the size of the sample, and perhaps a larger sample will show greater statistical significance.

The second part of the research was related to determining an influence of applied teaching approaches on the self-perceived mental effort among students. The obtained results have shown, that students in LIBE group estimate their mental effort to be lower compared to students in other groups. This result indicates that LIBE approach causes less mental effort than ICBS or traditional teaching approach. At the same time, students in ICBS group estimate their mental effort to be lower compared to students in control group. According to cognitive theories of multimedia learning, learning is facilitated when content is presented in verbal and non-verbal (graphic) format [Mayer 2001]. Theories of multimedia learning indicate on positive effect multiple presentation has on understanding a concept. Multiple presentation of information can be used for encouraging students to learn, focusing their attention on relevant incoming information. Therefore, coherent mental representations are additionally facilitated by including integration of information and adopted knowledge. Results in this research are in agreement with the study, held by McKagan et al. [2008]. Students can construct their own understanding by starting simulations in simple states, allowing to gradually work up to exploring more advanced features and such approach is argued to reduce cognitive load.

The third part of the research was related to determining instructional efficiency and instructional involvement, influenced by each of teaching approach applied. Knowing the standardized value of students' achievement and self-perceived mental effort, efficiency and students' involvement can be calculated. The results show that efficiency and involvement for traditional teaching approach are negative and lower than efficiency and involvement for LIBE and ICBS. The highest value of efficiency is demonstrated in the approach based on LIBE. This environment is stimulating for students in terms of performance and invested mental effort. But in terms of motivational effect the ICBS approach stands out with the highest positive value of instuctional involvement. In their research Paas, Tuovinen, Van Merrienboer and Darabi [2005] emphasized that until now cognitive load theory has focused on the alignment of instruction with cognitive processes without recognizing the role of motivation in training. Further on they emphasise, that cognitive load researchers need to determine the motivational effects of instructional conditions and identify strategies, that keep student attention focused on learning. According to these authors ICBS approach is considered more beneficial for students because it requires less mental effort compared to traditional approach and leads to higher achievement and higher motivation, which in their turn lead to higher students' involvement. For further research, it would be interesting to examine student motivation and

find correlation between instructional involvement and students' motivation, focusing in particular on the component of respecting physics as a science.

Limitations of this research were the size of the sample, therefore further research will include students from several cities in the Republic of Serbia as well as in the whole region. Also, the authors are looking to expand their research to other topics in Physics, allowing the teachers can have the more complete picture of efficiency of different teaching approach(es). Thus, future empirical research should be focused on evaluating possibilities to implement the LIBE or ICBS methods for teaching other Physics topics in primary, secondary and high school by conducting reasearch on a larger sample with a longer durantion of the experiment of at least one semester.

Conclusions

The results of this research show that students, who received instruction through LIBE or ICBS methods, achieved higher scores on the knowledge test and also estimated their mental effort to be lower compared to students, who received instructions through a traditional teaching approach. Knowledge, acquired only through traditional teaching approach, forms a very important basis, but such way of learning leads to studends loosing their active role in the learning process. Better results can be achieved, when students have a more active role. In such cases students develop greater interest in the subject they study and achieve higher concentration during classes. This indicates that LIBE or ICBS teaching approaches achieve higher levels of instructional efficiency and instructional involvement compared to the traditional teaching approach. The values of instructional efficiency and instructional involvement for LIBE and ICBS approaches demonstrate, that these methods are more beneficial for students because they require less mental effort and result in highter achievement compared to traditional approach. At the same time, students' involvement is the highest for the ICBS approach. Data, obtained during the reasearch, indicate that students demonstrate great interest in using computers for learning physics. This approach causes the higher motivation, which in turn causes higher students' involvement.

References

Abrahams I., Millar R. (2008) Does Practical Work Really Work? A Study of the Effectiveness of Practical Work as a Teaching and Learning Method in School Science. *International Journal of Science Education*, vol. 30, no 14, pp. 1945–1969.

Ajredini F., Izairi N., Zajkov O. (2014) Real Experiments Versus PhET Simulations for Better High-School Students' Understanding of Electrostatic Charging. *European Journal of Physics Education*, vol. 5, no 1, pp. 59–70.

Ajredini F., Zajkov O., Mahmudi N. (2012) Case Study on the Influence of Simulations and Real Experiments on Higher Order Skills. *Macedonian Physics Teacher*, no 48, pp. 29–34.

Bennett S. J., Brennan M. J. (1996) Interactive Multimedia Learning in Physics. *Australian Journal of Educational Technology*, vol. 12, no 1, pp. 8–17.
Carterette E., Friedrnan M. (1996) Perceptual and Cognitive Development. *Handbook of Perception and Cognition* (eds R. Gelman, T. Au), San Diego, London: Academic Press, pp. 283–329.
Cerniglia A. J. (2012) *Instructional Efficiency and Learner Involvement* (PhD thesis). Available at: http://andrewcerniglia.com/?p=411#comments (accessed 10 July 2019).
Crook C. (1994) *Computers and the Collaborative Experience of Learning*. London: Routledge.
Drakulić V., Miljanović T. (2007) Efikasnost Laboratorijsko-Eksperimentalne Metode u Realizaciji Sadržaja Biologije u Gimnaziji. *Pedagogija*, no 4, pp. 627–632.
Homer B. D., Plass J. L. (2010) Expertise Reversal for Iconic Representations in Science Visualizations. *Instructional Science*, vol. 38, no 3, pp. 259–276. doi: 10.1007/s11251–009–9108–7
Jaakkola T., Nurmi S. (2008) Fostering Elementary School Students' Understanding of Simple Electricity by Combining Simulation and Laboratory Activities. *Journal of Computer Assisted Learning*, vol. 24, no 4, pp. 271–283. doi: 10.1111/j.1365–2729.2007.00259.x.
Jackson J., Dukerich L., Hestenes D. (2008) Modeling Instruction: An Effective Model for Science Education. *Science Educator*, vol. 17, no 1, pp. 10–17.
Jarrett L., Takacs G., Ferry B. (2010) Adding Value to Physics Laboratories for Preservice Teachers. *International Journal of Innovation in Science and Mathematics Education*, vol. 18, no 1, pp. 26–42.
Johnstone A. H., Al-Shuaili A. (2001) Learning in the Laboratory: Some Thoughts from the Literature. *University Chemistry Education*, vol. 5, no 2, pp. 42–51.
Jong T. de (2010) Cognitive Load Theory, Educational Research, and Instructional Design: Some Food for Thought. *Instructional Science*, vol. 38, no 2, pp. 105–134. doi 10.1007/s11251–009–9110–0.
Jong T. de (2006) Computer Simulations: Technological Advances in Inquiry Learning. *Science*, vol. 312, pp. 532–533.
Kalyuga S. (2008) *Managing Cognitive Load in Adaptive Multimedia Learning*. New York: Hershey.
Kalyuga S. (2009) *Cognitive Load Factors in Instructional Design for Advanced Learners*. New York: Nova Science.
Kant J. M., Scheiter K., Oschatz K. (2017) How to Sequence Video Modeling Examples and Inquiry Tasks to Foster Scientific Reasoning. *Learning and Instruction*, vol. 52, pp. 46–58. doi:10.1016/j.learninstruc.2017.04.005
Kirschner P. A. (2002) Cognitive Load Theory: Implications of Cognitive Load Theory on the Design of Learning. *Learning and Instruction*, vol. 12, pp. 1–10. Available at: http://dx.doi.org/10.1016/S0959–4752(01)00014–7 (accessed 10 July 2019).
Kostić A. (2006) *Kognitivna Psihologija* [Cognitive Psychology]. Belgrade: Educational institution and remedies.
Kuhn J., Vogt P. (2013) Smartphones as Experimental Tools: Different Methods to Determine the Gravitational Acceleration in Classroom Physics by Using Everyday Devices. *European Journal of Physics Education*, vol. 4, no 1, pp. 47–58.
Lee H., Plass J. L., Homer B. D. (2006) Optimizing Cognitive Load for Learning from Computer-Based Science Simulations. *Journal of Educational Psychology*, vol. 98, no 4, pp. 902–913.
Liu C. Y., Wu C. J., Wong W. K., Lien Y. W., Chao T. K. (2017) Scientific Modeling with Mobile Devices in High School Physics Labs. *Computers & Educa-*

tion, vol. 105, 01.02.2017, pp. 44–56. Available at: http://dx.doi.org/10.1016/j.compedu.2016.11.004 (accessed 10 July 2019).

Mayer R. E. (2001) *Multimedia Learning*. New York: Cambridge University.

Mayer R. E., Moreno R., Boire M., Vagge S. (1999) Maximizing Constructivist Learning from Multimedia Communications by Minimizing Cognitive Load. *Journal of Educational Psychology*, vol. 91, no 4, pp. 638–643.

McKagan S.B., Perkins K. K., Dubson M. et al. (2008) *Developing and Researching PhET Simulations for Teaching Quantum Mechanics*. Available at: http://www.colorado.edu/physics/EducationIssues/papers/QMsims.pdf (accessed 10 July 2019).

Merriënboer J. J.G. van, Sweller J. (2005) Cognitive Load Theory and Complex Learning: Recent Developments and Future Directions. *Educational Psychology Review*, vol. 17, no 2, pp. 147–177. doi: 10.1007/s10648–005–3951–0

Miller J. D. (1998) The Measurement of Civic Scientific. *Public Understanding of Science*, no 7, pp. 203–223.

Muller D. A. (2008) *Designing Effective Multimedia for Physics Education* (PhD Thesis). Sydney: University of Sydney. Available at: http://www.physics.usyd.edu.au/super/theses/PhD%28Muller%29.pdf (accessed 10 July 2019).

National Research Council (2000) *Inquiry and the National Science Education Standards*. Washington, DC: National Academy Press.

Odadžić V., Miljanović T., Mandić D., Pribićević T., Županec V. (2017) Effectiveness of the Use of Educational Software in Teaching Biology. *Croatian Journal of Education*, vol. 19, no 1, pp. 11–43.

Paas F., Tuovinen J. E., Tabbers H., Gerven P. W. van (2003) Cognitive Load Measurement as a Means to Advance Cognitive Load Theory. *Educational Psychologist*, vol. 38, no 1, pp. 63–71. Available at: https://doi.org/10.1207/S15326985EP3801_8 (accessed 10 July 2019).

Paas F., Merriënboer J. van (1993) The Efficiency of Instructional Conditions: An Approach to Combine Mental Effort and Performance Measures. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, vol. 35, no 4, pp. 737–743.

Paas F., Tuovinen J. E., Merrienboer J. J. van, Darabi A. A. (2005) A Motivational Perspective on the Relation between Mental Effort and Performance: Optimizing Learner Involvement in Instruction. *Educational Technology Research and Development*, vol. 53, no 3, pp. 25–34. Available at: https://doi.org/10.1007/BF02504795 (accessed 10 July 2019).

Plass J. L., Homer B. D., Hayward E. O. (2009) Design Factors for Educationally Effective Animations and Simulations. *Journal of Computing in Higher Education*, vol. 21, no 1, pp. 31–61. doi: 10.1007/s12528–009–9011-x

Radulović B., Stojanović M. (2015) Determination Instructions Efficiency of Teaching Methods in Teaching Physics in the Case of Teaching Unit "Viscosity. Newtonian and Stokes Law". *Acta Didactica Napocensia*, vol. 8, no 2, pp. 61–68.

Radulović B., Stojanović M., Županec V. (2016) The Effects of Laboratory Inquire-Based Experiments and Computer Simulations on High School Students' Performance and Cognitive Load in Physics Teaching. *Zbornik Instituta za Pedagoška Istraživanja*, vol. 48, no 2, pp. 264–283. doi: 10.2298/ZIPI1602264R

Schwerdt G., Wuppermann A. C. (2011) Is Traditional Teaching Really All that Bad? A Within-Student Between-Subject Approach. *Economics of Education Review*, vol. 30, no 2, pp. 365–379. Available at: https://doi.org/10.1016/j.econedurev.2010.11.005 (accessed 10 July 2019).

Stamenkovski S., Zajkov O. (2014) Seventh Grade students' Qualitative Understanding of the Concept of Mass Influenced by Real Experiments and Virtual Experiments. *European Journal of Physics Education*, vol. 5, no 2, pp. 6–16.

Steinberg R. N. (2000) Computers in Teaching Science: To Simulate or Not to Simulate? *American Journal of Physics*, vol. 68, no S1, pp. S37–S41.
Sweller J. (1994) Cognitive Load Theory, Learning Difficulty, and Instructional Design. *Learning and Instruction*, vol. 4, pp 295–312. Available at: http://dx.doi.org/10.1016/0959–4752(94)90003–5 (accessed 10 July 2019).
Sweller J., Ayres P., Kalyuga S. (2011) *Cognitive Load Theory*. New York: Springer.
Sweller J., Chandler P. (1994) Why Some Material Is Difficult to Learn. *Cognition and Instruction*, no 12, pp. 185–233.
Trees A. R., Jackson M. H. (2007) The Learning Environment in Clicker Classrooms: Student Processes of Learning and Involvement in Large University-Level Courses Using Student Response Systems. *Learning, Media and Technology*, vol. 32, no 1, pp. 21–40. doi: 10.1080/17439880601141179
Vollmer M., Möllmann K. P. (2011) Low Cost Hands-On Experiments for Physics Teaching. *Latin-American Journal of Physics Education*, vol. 6, suppl. I, pp. 3–9.
Wang J., Jou M. (2016) Qualitative Investigation on the Views of Inquiry Teaching Based upon the Cloud Learning Environment of High School Physics Teachers from Beijing, Taipei, and Chicago. *Computers in Human Behavior*, vol. 60, July, pp. 212–222. Available at: http://dx.doi.org/10.1016/j.chb.2016.02.003 (accessed 10 July 2019).
Zacharia Z. (2003) Beliefs, Attitudes, and Intentions of Science Teachers Regarding the Educational Use of Computer Simulations and Inquiry-Based Experiments in Physics. *Journal of Research in Science Teaching*, vol. 40, no 8, pp. 792–823.
Zacharia Z., Anderson O. R. (2003) The Effects of an Interactive Computer-Based Simulation Prior to Performing a Laboratory Inquiry-Based Experiment on Students' Conceptual Understanding of Physics. *American Journal of Physics*, vol. 71, no 6, pp. 618–629. doi: 10.1119/1.1566427
Zajkov O., Mitrevski B. (2012) Video Measurements: Quantity or Quality. *European Journal of Physics Education*, vol. 3, no 4, pp. 34–43.
Županec V., Miljanović T., Pribićević T. (2013) Effectiveness of Computer Assisted Learning in Biology Teaching in Primary Schools in Serbia. *Journal of the Institute for Educational Research*, vol. 45, no 2, pp. 422–444.
Županec V., Radulović B., Pribićević T., Miljanović T., Zdravković V. (2018) Determination of Educational Efficiency and Students' Involvement in the Flipped Biology Classroom in Primary School. *Journal of Baltic Science Education*, vol. 17, no 1, pp. 162–176.

Appendix 1. An example of post-test tasks.

On the scale from 1 to 5, please evaluate how difficult did you find each task, by circling the revelant number after each task.

1 = Very easy; 2 = Easy; 3 = Neither easy nor difficult; 4 = Difficult; 5 = Very difficult

1. Viscosity is a consequence of:

   a) attracting intermolecular forces within one layer
   b) rejection of intermolecular forces within one layer
   c) fluid movement
   d) none of the above

2. What is the adhesion force?

   a) a) the forces of attraction between the same molecules
   b) b) the forces of attraction between different molecules
   c) c) the forces of repulsion between the same molecules
   d) d) the forces of repulsion between different molecules

4. Why it is difficult to separate two horizontal glass panels by pulling them apart, if there is a small amount of water between them?

   a) because of surface tension
   b) because of viscosity
   c) because of capillarity
   d) because of density

6. Why the molecules on the surface of the liquid have additional potential energy?

   a) because the resultant inter-molecular forces are zero
   b) because the resultant inter-molecular forces are not zero
   c) because of a higher viscosity force
   d) because of a higher speed of molecules

8. Will the stone fall to the bottom of the lake faster in winter, when the water temperature is lower, or in summer, when the water is warmer?

   a) In winter
   b) In summer
   c) temperature does not affect the speed of the falling stone
   d) neither in winter nor in summer

10. Why the drops of oil on the surface of the warm soup have a circular shape?

    a) because of surface tension
    b) because of viscosity
    c) because of capillarity
    d) because of density

13. Can the water pass through a thick sieve without leaving any drops?

    a) It will not pass due to cohesive forces
    b) It will not pass due to adhesive forces
    c) It will pass due to the aggregate state
    d) It will pass due to density

14. Which expression is correct for calculating the height to which the fluid drops / climbs in a tube submerged in a container?

a) $h = \frac{2\gamma}{\rho \cdot g \cdot r}$ c) $h = \frac{\gamma}{\rho \cdot g \cdot r}$

b) $h = \frac{4\gamma}{\rho \cdot g \cdot r}$ d) $h = \frac{2\gamma}{\rho \cdot g}$

15. Brass balls 0.5 mm in diameter fall through fluid with density ρ_o = 1,26 g/cm^3 with constant speed 6.7 mm/s. Determine the coefficient of viscosity of liquids. The density of the brass is ρ = 8,55 g/cm^3.

a) η = 0,15 Pa·s c) η = 0,5 Pa·s

b) η = 0,8 Pa·s d) η = 0,3 Pa·s

17. What is the velocity of a ball that falls through a fluid with viscosity of 0,65 Pa·s? The diameter of the ball is 1 mm, the density of the ball is 1000 kg/m^3, and the density of the liquid is 680 kg/m^3.

a) $\upsilon = 8{,}4 \cdot 10^{-4}$ m/s c) υ = 8,4 m/s

b) $\upsilon = 3 \cdot 10^{-4}$ m/s d) υ = 3 m/s

MOOCs in Higher Education: Advantages and Pitfalls for Instructors

U. Zakharova, K. Tanasenko

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Ulyana Zakharova
Candidate of Sciences in Philology, Head of Science and Methodology Department, Institute of Distance Education, National Research Tomsk State University; Research Fellow, Center of Sociology of Higher Education, National Research University Higher School of Economics. Address: 20 Myasnitskaya St, 101000 Moscow, Russian Federation. Email: uzakharova@hse.ru
Kristina Tanasenko
Career Advisor, Institute of Distance Education, National Research Tomsk State University. Address: 36 Lenina Ave, 623049 Tomsk, Russian Federation. Email: tanasenko@ido.tsu.ru

Abstract. The article explores the advantages and pitfalls of Massive Open Online Courses (MOOCs) as reported by participants of professional development programs on creating and using online courses initiated by the Institute of Distance Education of National Research Tomsk State University during a brainstorming session within one of the programs and during communication in a nonpublic online course forum within another one. It is established that instructors see MOOC advantages in the opportunity to provide better organization of the learning process and learning materials, higher education accessibility and academic mobility, realization of instructors' career and personal goals, and resource efficiency. MOOC pitfalls are associated by the participants with pedagogical imperfections of the format, special requirements for the education system, resource intensity, and career risks for instructors.

Keywords: higher education, Massive Open Online Course (MOOC), online learning, career risks for instructors, resource efficiency, resource intensity, education accessibility.

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The concept of human capital suggests that the knowledge and skills that people possess enable them to create value in the global economic system [World Economic Forum 2017:3]. The 21st century requires that professionals learn new technologies and upgrade their competencies on a regular basis. Russia ranks 37th in terms of digital skills among population and 66th in terms of the extent of staff training out of 140 economies [World Economic Forum 2018:485]. In October 2016, the Presidential Council for Science and Education adopted the national priority project Modern Digital Educational Environment in the Russian Federation, which has the potential to improve the situation

in the future. The project aims to create conditions to enable consistent enhancement of lifelong learning quality and opportunities for all population categories. The project developers suggest achieving this goal by advancing Russia's digital learning environment and increasing the number of students with MOOC experience from 35,000 to 11,000,000 by the end of 2025.[1] In 2017, the Ministry of Science and Education of Russia held a grant competition and selected 16 universities to be at the wheel of integrating various initiatives to achieve the project goals[2]. Those universities are the change drivers, drawing other colleges to promoting online education.

It was in 2012 that Western universities embarked laboriously on the production of massive open online courses (MOOCs). The MOOC format implies an unlimited number of participants, no selection process on whatever criteria, permanent accessibility of the course content online, and total study load for a participant being at least 1 ECTS (credit)[3]. What motivates universities to develop MOOCs? First of all, they seek to provide more flexible learning opportunities, increase institutional visibility, reach new students, and experiment with innovative pedagogy [Jansen, Konings 2017:20]. However, the importance of MOOCs in embracing innovative pedagogy has diminished in the eyes of university administrators in the United States and Europe [Allen, Seaman 2015:35, Jansen, Konings 2017:17], and instructional quality of MOOCs was found to be low [Margaryan, Bianco, Littlejohn 2015:82].

In a situation where research interest in MOOCs has weakened and their instructional value has been called to question, it is important to find out how they are perceived by university instructors. Instructors' contribution to the development of online education is hard to overestimate: they develop courses, integrate them in their disciplines, and shape or at least affect students' perceptions of MOOCs as a result of regular instructor-student interactions. Therefore, university professors are extremely significant, if not key agents in the integration of online education. It appears thus even more surprising that instructor-related MOOC research has been very limited so far, as a number of studies indicate [Evans, Myrick 2015:295; Deng, Benckendorff, Gannaway 2017:179; Veletsianos, Shepherdson 2016:214; Liyanagunawardena, Adams, Williams 2013:216–217; Deng, Benckendorff, Gannaway 2017:9; Bozkurt, Ozdamar Keskin, de Waard 2016:204].

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[1] Modern Digital Educational Environment in the Russian Federation: http://neorusedu.ru/about

[2] Podvedeny itogi pervogo etapa proekta "Sovremennaya tsifrovaya obrazovatel'naya sreda v RF" [Summary Report of the First Phase of Modern Digital Educational Environment in the Russian Federation]. *Uchitelskaya gazeta*, April 13, 2018: http://ug.ru/news/24799

[3] Definition Massive Open Online Courses (MOOCs), 2015: https://openuped.eu/images/docs/Definition_Massive_Open_Online_Courses.pdf

Russian studies focusing on MOOC instructors' attitudes, experiences and teaching recommendations are even less numerous than those in English. Meanwhile, findings in this area of research could serve the basis for effective managerial decisions in the digitization of education.

Given the broad definition of the term "perceptions", this study only explores how instructors perceive the advantages and pitfalls of MOOCs. Thematic analysis is used to clarify the position of Russian faculty on this issue and compare to the international context.

1. Evolution of the Issue: The International and Russian Contexts

Since MOOCs originated in the United States and then made their way to Europe, it appears advisable to analyze the Russian context of the problem within the global framework. A search across English-language publications presenting findings of empirical studies and reviews yielded 18 articles authored by researchers in Australia, England, Hong Kong, Spain, Columbia, Romania, Singapore, the United States, and Switzerland: Deng, Benckendorff, Gannaway 2017; Evans, Myrick 2015; Gil-Jaurena, Domínguez 2018; Lin, Cantoni 2018; Literat 2015; Lowenthal, Snelson, Perkins 2018; Ospina-Delgado, García-Benau, Zorio-Grima 2016; Ulrich, Nedelcu 2015; Zheng et al. 2016; and also Agarwal 2012; Allon 2012; Belanger, Thornton 2013; Duneier 2012; Evans 2012; Head 2013; Kaul 2012; Kolowich 2013; and Roth 2013—presented in a review [Hew, Cheung 2014]. The MOOC advantages and pitfalls identified across the publications listed above can be grouped into thematic clusters.

MOOC advantages, as perceived by instructors, are divided into three groups.

1. Opportunity to provide better organization of the learning process and better content structuring.
   Instructors believe that MOOCs promote flexibility in learning by combining different formats and improve the quality of MOOCs and their offline equivalents as a result of learner reviews.

2. Realization of instructors' career and personal goals.
   This category of MOOC advantages includes:
   - Advertising opportunities (promotion of a specific MOOC, the university that developed it, and other courses taught by the same instructor);
   - Experience of working with the new education format (analyzing and experimenting with innovative teaching approaches; opportunity to teach to a broad and diverse audience);
   - Opportunity to fulfill instructor's personal aspirations (working to establish a reputation; a chance to be the first to launch a MOOC among the faculty; a way to extend the list of achievements; establishing new connections);
   - A chance to share one's knowledge and experience (contribute to

open education, increase visibility of one's discipline, and engage in knowledge communication as such);
- Embracing the research potential of the new education format (MOOCs offer a possibility to reach large audiences and can be used as an experimental ground for trying out new teaching methods, conducting sociological, pedagogical and other types of research, etc.);
- Financial incentives (offered by some universities for MOOC development);
- Professional growth and certification opportunities (upon completing a course, learners (the instructor may act as a learner) may apply for a certificate of completion, provided that they meet the developer and platform requirements).

3. Accessibility and social mobility (MOOCs are accessible to a wide audience including adults and learners from other countries, suitable for self-paced learning, and free—having originally emerged as a way to get free access to top professors' courses).
   MOOC pitfalls, as perceived by instructors, are grouped into four categories.

4. Pedagogical imperfections of the format:
   - Challenges associated with teaching heterogeneous audiences with different levels of educational attainment, national characteristics, and cultural backgrounds;
   - No face-to-face interaction with students, which includes the feeling of "talking to a wall" when recording video lectures, lack of immediate response from students, and low student activity even in forum discussions;
   - Limited possibilities for student assessment (since a MOOC can be attended by hundreds and thousands of learners, assessment of assignments cannot be done by the instructor, so automatic assessment procedures are used; however, tests with multiple-choice and matching questions are the only ones that platforms assess unfailingly accurately);
   - Imperfection of the system as compared to offline education (low learner engagement, limited teaching strategies, and inapplicability of success indicators typical of traditional classrooms, such as low student attrition rate).

5. Special requirements that MOOCs impose on the education system.
   International findings indicate that faculty policies should change to ensure successful integration of MOOCs in traditional classrooms. In particular, the following is required:
   - Provide strong administrative support for MOOC instructors to maintain their motivation to work under the new format; resource,

political, and technical support; acceptance of MOOCs (MOOCs should be included in professors' teaching hours instead of being part of their extra workload; resources should be allocated for course-related research; additional time should be provided for content development);
- Provide assistance in MOOC production and coordination (tutoring and forum administration; technical support in course development, creation of audiovisual and interactive course materials, and MOOC didactics);
- Ensure protection of MOOC instructors' copyright;
- Solve logistic issues associated with collaborative course development, which usually implies participation of diverse experts.

6. Resource intensity (both MOOC production and interaction with learners are highly time-consuming; high financial and labor costs; high stress levels during course development).

7. Professional risks (reputational risks for professors creating an online course as a new educational product and bringing it to the global market).

Now, as we have got an idea of global research findings on instructors' perceptions of MOOCs, we can move to describing the situation in Russia. The number of Russian-language MOOC-related publications peaked in 2015–2016, 3–5 years later than on other countries. This gap closed over time, so that in 2016–2018Russia, the United States, and Europe engage almost simultaneously in experimental, research, and development activities designed to regulate the use of online courses and integrate them in traditional classrooms.

Of all the MOOC-related publications in Russian discovered, only one meets all our requirements. Yana Roshchina, Sergey Roshchin, and Viktor Rudakov [2018] used a survey of instructors and students to find out their perceptions of MOOC advantages and pitfalls. As for the rest of the publications, we only sampled those in which instructors described their own experiences of creating or using MOOCs or administrators described their interaction with MOOC instructors. The resulting data was distributed among the same thematic clusters as the English-language publications. The following groups of MOOC advantages perceived by Russian instructors have been identified.

8. Opportunity to provide better organization of the learning process and learning materials:
- Self-paced learning, use of modern methods and materials, course diversity [Roshchina, Roshchin, Rudakov 2018:183–184];
- Possibility to make distance students work consistently between exam sessions [Vaganova, Telegina 2017:125];

- Assistance in unlocking learners' potential and "developing their professional and personal qualities" [Mozhey, Lukyanov 2017:45];
- Availability of self-study materials for students; automated or peer-review assessment of student assignments [Zhuk 2016:237];
- Increased tutoring assistance; implementation of problem-based learning by integrating offline university courses with top professors' MOOCs [Mozhaeva 2016:237].

9. Realization of instructors' career and personal goals:
   - Professional self-development [Roshchina, Roshchin, Rudakov 2018];
   - Acquisition of new competencies [Yelizaryeva 2016:98].

10. Accessibility and mobility (wide access to education [Roshchina, Roshchin, Rudakov 2018]).

The MOOC pitfalls identified in papers written in Russian have been divided into three groups:

11. Pedagogical imperfections of the format:
    - No "live" student-professor communication, personalized learning, or learner identity verification opportunities; high attrition rates; decrease of education quality; charges for receiving a certificate of completion [Roshchina, Roshchin, Rudakov 2018:183–184];
    - Challenges of instructor-learner communication [Azimov 2014:6];
    - The "authorship verification problem" and fixed MOOC integration schedules that may conflict with the academic term dates [Zhuk 2016:238].
    - Resource intensity (MOOC production requires heavy investments of money, time, and effort [Agapova 2015:40]).

Special requirements that MOOCs impose on the education system:

- Instructors must develop on-camera skills [Yelizaryeva 2016:98],
- Learners must have a high level of general cultural [Malkova et al. 2018:0578]

As we can see, MOOC instructors surveyed in Russia and other countries see MOOC advantages in the opportunity to provide better organization of the learning process and better content structuring, realization of instructors' career and personal goals, accessibility and social mobility. International findings indicate that MOOC pitfalls perceived by instructors include pedagogical imperfections of the format, special requirements to the education system, resource intensity, and professional risks for instructors. Russian professors report the same disadvantages except professional risks inflicted by the promotion of online education—no mention of this factor was found in the publications analyzed.

The survey data demonstrates that instructors describe their perceptions of MOOCs from the position of MOOC developers or integrators, being less likely to judge from the perspective of MOOC learners. Western professors tend to take on the role of MOOC developers more often, while Russian instructors talk from the position of authors as well as integrators.

This literature review shows that research in Russian instructors' perceptions of MOOCs is very limited. Available papers focus on instructors' perceptions of MOOC advantages and pitfalls related to the pedagogical aspects of MOOC production and implementation. Other types of benefits and drawbacks are only addressed in isolated publications, and professional risks are not mentioned in any article at all. Does it mean that those dimensions of online education are irrelevant to Russian professors? How do they perceive MOOCs in the context of active integration of online education that Russia sees in the recent years? How do their perceptions align with the global experiences? These are the questions that this study attempts to answer.

2. Method and Data

2.1. Participants

To collect accurate data on professors' perceptions of MOOCs, we needed respondents who would understand what a MOOC is and how exactly it is created and/or implemented, have some teaching experience to analyze MOOCs in its context, and not advocate explicitly either of the two dissenting opinions existing in the MOOC discourse. All of these criteria are met by participants of the professional development programs on creating and using online courses administered by Tomsk Regional Center of Online Education Competencies under the auspices of the Institute of Distance Education of National Research Tomsk State University, which took place in October 2017–June 2018. Those programs involved a total of 458 participants representing educational institutions (mostly universities) of all federal districts of Russia, including five faculty members from Kazakhstan and Belarus. Instructors accounted for the majority of survey participants.

2.2. Data

Perceptions of MOOC advantages and pitfalls for instructors reported by the participants of professional development programs during a brainstorming session within one of the programs and during communication in a nonpublic online course forum within another one provided the empirical basis of the research. Data was generated collectively in the former case and individually in the latter. A total of 272 judgments were singled out and analyzed.

2.3. Method

The respondents' judgments about MOOC advantages and drawbacks were grouped into thematic clusters based on the classification developed as a result of international literature analysis (which yielded a broader array of themes): opportunity to provide better organization of the learning process and better content structuring, accessibil-

ity and social mobility, realization of instructors' career and personal goals, pedagogical imperfections of the format, the need to adjust the education system to the new format at a number of levels, resource intensity, and professional risks. The judgments that did not match any of the themes specified were grouped into additional categories.

3. MOOC Advantages for Instructors

Most judgments about MOOC advantages can be distributed among the three groups identified during the review of MOOC-related publications in the English language. The rest of the judgments formed an additional group, resource efficiency for instructors. Below, each of the four groups is examined in detail.

3.1. Opportunity to provide better organization of the learning process and better content structuring

The survey participants believe that better organization of the learning process allowed by MOOCs primarily manifests itself in learner autonomy. Students work actively with study materials, and instructors monitor performance of every student by delegating routine assessments to the platform algorithms (which makes assessment fast and unbiased).

> "Online courses are a very efficient way to get students to work independently. This type of learning requires a high degree of responsibility. This is what Russian students sometimes lack, as compared to Western Europe where self-organization is encouraged."

An important advantage of online courses is that they allow building personalized learning trajectories, whether in general or to achieve specific customized goals. In particular, a student might want to progress through the course at a higher speed in order to get ahead of the syllabus or, vice versa, to catch up if they dropped out for some reason. When a student has to take make-up exams in certain courses after taking a parental or sick leave, going on a trip, or transferring to another university or department, engaging in an online course within a for-credit program is a good option.

Using MOOCs also contributes to reallocation of student learning time. The lack of teaching hours for specific topics is compensated for by using online courses, and the freed classroom time is devoted to other types of work. In the former case, the respondents mean that students use online courses to learn some important material that used to be left out of the curriculum due to the lack of time. In the latter one, online courses are used to embrace material that professors normally delivered in the classroom.

> "MOOCs will save instructors from telling the same naked theory over and over again in lectures, as it can always be read or watched online. I do not believe that MOOCs can completely replace live professor lectures, but an adequate mix of the two is a must."

Once a topic has been embraced independently in an online course, live classes can be devoted to question answering, practical sessions, etc.

> "If I use online resources, I will be able to enhance certain interactions with students and devote more time and effort—cognitive and emotional—to other types of interactions that constitute the value and meaning of pedagogical communication."

A mixed format combining in-class and online education is regarded as possibly the best way to redistribute the learning time allocated for specific disciplines, as it implies flexibility and a certain degree of novelty, which has a positive impact on student involvement.

The survey participants do not associate the transition to online courses with a decrease in communication with students. In fact, they report that this approach allows "extending the array of interactions with students", exchanging "immediate feedback with learners in forums", and even "communicating with students 24/7."

Some characteristics of MOOC content were also emphasized by the respondents. Abundance and diversity, for instance, were reported to enrich the learning environment. Another important characteristic of online courses is their illustrative value. Some courses include video lectures recorded at manufacturing sites, animation of invisible processes, simulators of rare or hazardous equipment, and many more. It was also pointed out that online courses normally present material in concentrated form, enhancing learning effectiveness and reducing the time required to master new knowledge and skills.

3.2. Accessibility and mobility

Characteristics of MOOCs as such are described by the respondents as closely connected to those of MOOC content. Accessibility of online education is associated with the possibility of reaching broad audiences, which may include "prospective college applicants, students, and candidates in full-time and distance education programs as well as people with disabilities."

> "If the physical learning environment is unable to offer ramps to wheelchair users and elevators to cerebral palsy patients, online learning is the only way to show them that we do care and that we are willing to provide them with education opportunities."

Mobility that MOOCs offer implies that students can learn "anytime, anywhere", course content can be "accessed online 24/7", and instructors can engage in effective interactions with students remotely, regardless of location.

3.3. Realization of instructors' career and personal goals

According to the study participants, online courses offer opportunities for professional growth to instructors, who can use them to acquire

new competencies and experience, "outline directions for further career planning" (obviously, professors expect MOOCs to remain a viable direction in education development in the foreseeable future), and enhance their level of expertise.

> "In my professional practice, I want to be interesting to students not only as a teacher of English but also as someone who is ahead of them in technology and can offer various methods, formats, and resources for their learning activities."

Online courses that instructors integrate in their disciplines may be created by other professors, so MOOCs also encourage professional communication and academic networking, allowing instructors to adopt the pedagogical and creative practices followed by their colleagues and use them to change the way they deliver course material. At the same time, development of their own MOOCs allows professors to "express themselves", "be creative", "share their methodological insights with the community", "popularize their own ideas", and "promote themselves". Since some universities provide instructors with financial awards or online course development, additional income was also mentioned among the benefits of MOOCs.

3.4. Resource efficiency

The additional group of MOOC advantages that were not identified in English-language publications includes the benefits associated with saving instructors' resources. First of all, this is about time saving. While the first group of advantages involved saving time to devote it to other types of learning activities—such as those that imply a higher degree of learner-instructor interaction than in lectures—in this case instructors increase their off-work time, which they can use as they wish. This includes reduced classroom workload (instructors simply work less), flexible schedules, more opportunities for rational time planning, and "using software instead of wasting time on far-away trips." The participants mentioned other types of resources as well, most often "physical" and "vocal", which can be saved by using video lectures, presentations, and practical tasks offered by MOOCs. It was difficult to identify exactly the type of resource in some responses, as it could be any one or all of them at once: online courses "partly free instructors from in-class sessions"; "having once created a course, you can use it over and over again, with some adjustments", "no need to reproduce theoretical material in lectures."

4. MOOC Pitfalls for Instructors

Below, we present the results of analyzing the judgments about MOOC pitfalls for instructors. This time, all the clusters identified in the English-language publications are represented in the Russian-language articles as well.

4.1. Resource intensity

As the survey participants report, online courses involve considerable labor costs, "higher than in the traditional system". They are unavoidable at every stage of working with MOOCs: development ("the need to devise a course structure in advance"), assistance on the MOOC platform and regular content updates ("course materials must be updated all the time") or editions, if needed ("a course may require some adjustments before being offered on a different platform").

> "Sometimes it can be even more challenging than teaching in the classroom. Meanwhile, how much a professor earns depends mostly on the number of their classroom teaching hours."

Pay injustices that this respondent complains about result from the fact that classroom workload in online courses, due to their short duration, is smaller than in their offline equivalents.

Instructors who do not develop online courses but only use the ones that already exist also experience extra labor costs due to the "need to restructure the course and adjust the ratio of lectures, practical seminars, and independent work". Not only are all of those activities fraught with extra labor costs ("damage to health") but they are also time-consuming.

Resource intensity of using online courses in education also manifests itself in the "fee- or conventional fee-based nature" of MOOC platforms. MOOC learners may be required to pay for a proctoring service (identity verification and authentication system), certificate of completion, or access to graded quizzes or other components of the course (such as with Coursera's Premium Assessment package). Furthermore, even enrollment in a free online course requires an Internet accessing device (PC, smartphone) and prepaid Internet services. For this reason, universities are trying to find answers to the following questions: should the opportunities offered by MOOC platforms be paid by students or universities incorporating MOOCs in their curriculum? how to organize the payment procedure correctly? how to pay professors who "delegate" some topics to the MOOC creator to reduce their own classroom workload? should universities revise the allocation of funds received for public-funded students who engage actively in online courses of another university? These questions overlap with the group of MOOC pitfalls "special requirements to the education system" that will be described later on in this article.

4.2. Pedagogical imperfections of the format

While appreciating the opportunity to enhance the learning process, the respondents often complained about pedagogical imperfections of MOOCs. These include difficulties with student monitoring in the first place, caused by issues in learner identification and peculiarities of assessing learning outcomes in large-scale online classrooms. With online learning, it is hard to guarantee that a learner has not cheated,

copy-pasted a peer's answer, or asked someone who is better in the subject to do the assignment for him or her.

Instructors claimed that using third-party MOOCs for blended courses, they lack the opportunity to see their students' grades achieved on the platform. Students submit a copy of certificate issued by the platform, which may be a fake, and demonstrate a record of grades in their personal profile or their final exam performance report confirming the acquisition of required competencies (provided that the final assignment was designed correctly). Instructors may test students' knowledge of course material as a re-assessment or topic-specific assessment. The most relevant and accurate solution to the problem of informing professors about student performance on a MOOC platform is to ensure that platforms provide learner performance data to universities, these data exchange may be a part of the partnership agreement between the university that uses a MOOC and the one that has developed it. For example, partnership agreements regulating the courses offered by the Open Education platform involve creating a personal account for the integrating university where all the information about affiliated students and their academic performance is displayed.

The guarantee that educational outcomes exported from the platform were obtained by the enrolled learner and not someone else has been getting stronger due to advancements in proctoring services. Proctoring systems rely on the typing style, voice patterns, and facial expression to verify that the person doing an assignment is the one that registered for the course. Facial expression is compared against the photo in the user's ID, which contains personal data that should also match with the information submitted during the registration process and specified in the certificate of completion.

Another problem of student monitoring in MOOCs concerns the "methodological limitations of platform knowledge and skill assessment tools". The most widespread type of MOOC assignments today is multiple-choice tests, sometimes matching and short-answer questions—all assessed automatically. This format of knowledge testing entails a number of constraints: first, tests are not effective for all levels of knowledge; second, answers should match exactly the sequence of symbols accepted as correct by the system. An error in one symbol (e. g. comma/period as a decimal separator) may result in counting the item incorrect, whereas in live interactions, instructors could consider such errors insignificant.

Today, online education platforms offer three alternatives to automated assessment. The first one, instructor assessment, is applied extremely rarely due to the size of audiences. It is normally used to assess some special types of assignments, such as those submitted for competitions, or when a disputable situation needs to be resolved, e. g. when a learner does not agree with the results of automated or peer assessment. The second alternative is self-assessment, where

learners upload their assignments and are given assessment criteria. The third alternative option is peer grading, which implies that an assignment is assessed according to the instructor's criteria by a randomly selected peer learner. There is some skepticism about the latter two methods among instructors, as they consider learners "underqualified to perform the assessment procedure".

The problem of assessment gets particularly serious when it comes to final assignments, which require a higher level of knowledge than merely being able to reproduce facts, especially in applied courses. The factor of large audiences makes peer assessment the only sensible method to assess performance in final examinations, which have an essential weight in the final course grade. That being so, none of the alternatives to automated assessment is perfect.

The lack of active "live" communication is another drawback of online courses perceived by professors as representatives of a person-to-person occupation.

> "It is funny that students have been asking for additional offline lectures over the last two years, and they just do not want the online format. What is the most interesting is that when I do include a real-life class, the attendance rate is 100%."

> "Since we are working with a generation that knows little or nothing about how to communicate, propagation of online learning will exacerbate the communication issues."

"In a number of occupations, the ability to speak and communicate with customers is an indispensable skill! To my utter dismay, our students do not know how to communicate." Some respondents relate the lack of communication in online courses to a broader context of "no authentic vibe" and "depersonalized learning".

Apparently, all these limitations have adverse effects on instructors' trust in the new educational technology. This can be illustrated by the following statements.

> "I am afraid that the development of online learning may go along the path of replacing professional education with shallow knowledge—we already observe some manifestations of that, like MOOC credits shifts."

> "I suggest that this type of education will end up with people who want to be always in advance of everyone else in whatever domain, grasping all the "trendy" opportunities and hyping them up—naturally, for the sake of technology enhancement and modernization, which actually generate very questionable outcomes."

4.3. Special requirements to the education system

The survey participants admit that the integration of online courses requires changes to the education system. Inconsistencies between the existing system and the innovations being introduced can be identified based on the system elements the respondents believe should be affected by those necessary changes.

Students lack "qualifications" to engage in online courses, but this is the question of self-organization, self-control, time management, and other soft skills, not hard ones. The problem of student performance monitoring discussed above is relevant because online education implies a high level of self-organization. However, "the proportion of highly self-organized students is small; where independent work is of particular importance (e. g. in distance education), students often ignore it completely, accumulating incomplete assignments or doing them as a mere formality," a survey participant says. Because of low student self-organization, another respondent insists that "using MOOCs in Bachelor's degree studies should be avoided."

To create and use online courses, instructors need to embrace new competencies—such as on-camera skills—but they also need to enhance the skills they already have, as MOOCs impose "increased requirements to course content development and structuring", and "technologically, creation of an online course is more time-consuming and requires more knowledge and competencies." Those requirements may be fulfilled by involving audiovisual media designers and experts in instructional methodology to course development. As one of the participants said, "a good MOOC is a product of a big team's efforts." In case the university does not provide instructors with an adequately qualified assistance team, MOOC developers may have to do all the work themselves, which often implies self-training.

Anyway, high requirements to MOOC quality remain relevant. First of all, online courses bring professors' work to a high level of transparency, as every lesson in a MOOC is open. Second, online courses compete for learners and sometimes their money, so a MOOC must be in demand with an audience wide enough to attract a great deal of interested customers, while at the same time it must be unique to some extent to be chosen by prospective customers. It also must be difficult enough to offer new knowledge and at the same time easy enough to be taken alongside other courses and completed successfully. The survey participants believe that the established system of MOOC production and use has some features that affect negatively the quality of learning, which include "subjectivism in content assessment" at the stage of production, a low level of difficulty ("I wish they were more effective"), and inability to change third-party courses.

Some respondents were not sure that every professor could adapt to the online education reality: "not every instructor may be able to create a course due to their personal characteristics", such as "lack of charisma" or this is not a format for the third-age faculty". The respondents' judgments also reveal instructors' unwillingness to adapt

to the new format, the "need to change" being reported as a disadvantage of MOOCs.

> "Most professors are not willing—and will hardly ever be—to break their ' equilibrium'. They are used to giving classroom lectures and reading the same content over and over again. Those who decide to try, however, may fall into the hands of instructional designers who are not bound up in MOOCs but simply follow the formal design principles. It is not the quantity but the quality of MOOCs that matters."

It is not only students and professors who are not ready to embrace the new format—neither are university administrators. "The parties involved—including universities, faculties, and departments—are unprepared on a technical, psychological, and other levels to use" MOOCs, "encourage the integration of MOOCs", and actually "accept MOOCs and IT in general as part of education". Unpreparedness of the national education system, according to the respondents, consists in the "absence of any legal regulations in the field today", or "clearly defined standards of incorporating online courses in student workload", or "unified course development principles".

> "The key difficulties with using online courses in higher education are the lack of a comprehensive regulatory framework, the ambivalent ways in which the existing regulations are interpreted by law agencies, and uncertainties about the licensing and accreditation procedures."

Although the survey was conducted after the priority project Modern Digital Educational Environment in the Russian Federation was initiated, faculty's incompetence in the legal issues related to online education is obvious. Probably, even the availability of a national regulatory framework, in the absence of local university guidelines, leaves faculty members unconfident about finding acceptance and approval of their actions, which might be the reason for low instructor engagement in the development of online education.

The overall focus on education digitization is not lost on the survey participants, yet it inspires ambivalent feelings in them.

> "The necessity of using online learning is being actively imposed on us, and even professors whose disciplines are not really compatible with online courses are forced to use them."

> "At some point, it will become mandatory for professors, but no additional time to develop quality courses will be offered. I wish so much we could stop doing something for the ake of doing and start achieving measurable outcomes at last."

4.4. Professional risks

The MOOC pitfalls classified as professional risks for instructors are mostly associated with the threat of losing job as a result of the integration of online courses into traditional classrooms, in particular the "possibility of pay cuts, given that a single instructor can now reach a wider audience", hence the "fear of being unwanted and needless". The survey participants believe that neither MOOC integrators nor MOOC developers are protected against being forced out by online courses.

> "Once I have developed a MOOC, my institution does not need me anymore. The knowledge has been digitized, and forums can be administered by someone else."

> "MOOCs, if regarded as an alternative, all other factors being equal, can actually compete with instructors."

> "The instructor disappears as a charismatic personality, which used to be a powerful factor of students' interest in a subject."

Another professional risk incurred by MOOC instructors, particularly MOOC developers, is the "alienation of title", which is about instructors transferring their copyright for a course to the employer, i. e. the developing university. In this case, it is the university, not the instructor, that selects the platform to offer the MOOC on and decides on the timeframes, access modes, monetization models, and so on. It is only if a university has those rights that an online platform will interact with it on the issues related to the course. Otherwise, platforms would have to negotiate organizational issues with each MOOC instructor individually. However, an alienation of title agreement does not exclude the possibility of negotiating those decisions with the instructor and prevents the university from referring to another person as the MOOC developer, meaning that copyright remains with the instructor who created the MOOC.

To summarize, a thematic analysis of survey participants' judgments revealed MOOC advantages and pitfalls for Russian instructors, which were distributed among the seven clusters identified on the basis of English-language publications, and one more cluster (resource efficiency) was added. The identified groups of MOOC benefits and drawbacks indicate that instructors recognize not only different but sometimes even contradictory qualities of online courses—the opportunity for better organization of the learning process and better content structuring along with pedagogical imperfections of the format and special requirements imposed by this format on the education system, resource efficiency along with resource intensity, realization of career and personal goals along with professional risks. Those advantages and pitfalls of MOOCs are perceived at all levels, by instructors as developers (new competencies, additional income), integrators (resource efficiency), and learners (certification).

5. Conclusion

This study systematizes the findings from Russian and international publications on MOOC advantages and pitfalls for instructors and provides an independent analysis of faculty members' judgments on the issue.

Judgments of 458 respondents are analyzed. Although the sample is fairly large, all the survey participants engaged in professional training programs on online education, which implies that they are likely to be committed to MOOCs. Consequently, the findings could hardly be extrapolated to all faculty members including professors—some of them may be strongly opposed to the format, and others may be totally unaware of it. However, the sampled instructors pointed out advantages as well as pitfalls of MOOCs, which means that even if the analysis results do not provide a comprehensive picture, they do reflect the current trends. Moreover, the MOOC disadvantages identified in this study indicate the hotspots which are so prominent that even MOOC advocates can see them. Further research involving instructors alone and diverse MOOC experiences will shed more light onto the findings obtained herein.

While being committed to the online learning system, the survey participants are poorly informed about MOOCs. Some professors mentioned the learner identity verification problem, which is now perfectly solved by proctoring services. Others described MOOCs as a source of extra income for instructors, but their understanding of the applicable pricing policies and pay rates is doubtful.

Notwithstanding the data limitations, the congruence of our findings to the inferences made by Russian and international researchers may be regarded as evidence of their credibility and adequacy of the research method selected. Concerning the Russian-language literature, the strong belief among our respondents that MOOCs allow for better organization of the learning process and better content structuring aligns with the findings obtained by Kristina Mozhey, Dmitry Lukyanov, Natalya Vaganova, Olga Telegina, Galina Mozhaeva, and Yana Roshchina with colleagues, the idea of the new format as a means of realizing instructors' career and personal goals—with the inferences made by Yulia Yelizaryeva, the perception of accessibility and social mobility as MOOC advantages—with the article by Roshchina and her co-authors, and the thoughts on resource efficiency—with the findings of Lyudmila Zhuk. The pitfall of pedagogical imperfections, which surfaced in our dataset, was mentioned in the publications by Elkhan Azimov, Roshchina, and Zhuk; additional requirements imposed by online courses on the education system were also identified in the studies by Yelizaryeva and Irina Malkova with her colleagues; resource efficiency was discussed by Nina Agapova. A novel finding is the group of disadvantages that has never been addressed in Russian literature before—that of professional risks incurred by MOOC developers and integrators.

The groups of MOOC advantages and pitfalls derived from Russian faculty's judgments come very close to the classifications proposed by researchers in other countries. Only two MOOC benefits reported in the international literature did not manifest themselves in the Russian data, (i) the opportunity to improve the quality of MOOCs or their offline equivalents using platform analytics and (ii) embracing the research potential of the new format. The Russian survey participants did not mention three MOOC disadvantages, (i) challenges of teaching audiences with diverse educational and cultural backgrounds, (ii) logistical problems in collaborative MOOC development, and (iii) reputational risks incurred by developers. All the three have to do with instructors as MOOC creators, not integrators. Perhaps, those disadvantages were not observed in this study because the survey participants were rather willing to assume the perspective of using MOOCs than creating them, which reflects the situation in Russia in general. In particular, key performance indicators of the priority project Modern Digital Educational Environment are the pace and scale of integrating online courses in higher education, not developing them.

Our study has discovered themes that have no equivalents in the international literature reviewed. These include the whole "resource efficiency" group (probably resulting, again, from the role of instructors as MOOC integrators widely assumed in Russia today) as well as some specific advantages (more communication with students) and pitfalls (high requirements to student self-organization and self-control skills). Adverse career effects of working with MOOCs for Russian instructors are associated with the risk of being dismissed from the university—not reputational risks, as for their international counterparts.

Possible replacement of instructors with online courses has been widely covered by the media, raising great concerns among professors—not only prospective MOOC integrators but also MOOC developers. The concerns will probably persist until a legal framework regulating the rights and obligations of instructors creating and using MOOCs in blended learning environments is elaborated and brought to the attention of all the parties involved.

Another problem, resource intensity of MOOCs—often referred to in Russian faculty members' judgments and thus requiring to be addressed by national MOOC stakeholders—can be alleviated by designing and disseminating the models and algorithms of online and blended course design among the instructors.

The opportunity for better organization of the learning process and content structuring is the advantage reported most often by higher education faculty in Russia as well as globally. At the same time, professors admit pedagogical imperfections of the MOOC format. On the one hand, this position of instructors may result from their personal unsuccessful experience of transferring their pedagogical ideas to online or blended learning courses. On the other hand, it may be

a manifestation of protest against the new technologies in education, which "cannot be better than a live instructor" or just an expression of the broad academic community's opinion in the absence of personal MOOC experience. This study did not find out the motivations behind those judgments, so it might be the subject of further research. If it turns out that instructors are actually unhappy with how pedagogical issues in online courses are solved based on their own MOOC experience, discussion must be initiated on doing large-scale research into instructors' perceptions of MOOC enhancement opportunities and engaging professors in solution development, implementation, testing, and optimization.

References

Agapova N. (2015) Opyt sozdaniya MOOK: vzglyad iznutri (metodicheskiy i upravlencheskiy aspekty) [The Experience of MOOC creation: An Outward Glance (Methodical and Managemental Aspects)]. *Open and Distance Education*, no 4 (60), pp. 36–43.

Allen E. I., Seaman J. (2015) *Grade Level: Tracking Online Education in the United States*. *Babson Survey Research Group and Quahog Research Group,* LLC. Available at: http://www.onlinelearningsurvey.com/reports/gradelevel.pdf (accessed 1 August 2019).

Azimov E. (2014) Massovye otkrytye onlain-kursy v sisteme sovremennogo obrazovaniya [Massive Open Online Course in Modern Educational System]. *Distantsionnoe i virtualnoe obuchenie*, no 12 (90), pp. 4–12.

Bozkurt A., Ozdamar Keskin N., Waard I. de (2016) Research Trends in Massive Open Online Course (MOOC) Theses and Dissertations: Surfing the Tsunami Wave. *Open Praxis*, vol. 8, no 3, pp. 203–221.

Deng R., Benckendorff P., Gannaway D. (2017) Understanding Learning and Teaching in MOOCs from the Perspectives of Students and Instructors: A Review of Literature from 2014 to 2016. Digital Education: Out to the World and Back to the Campus. Proceedings of the *5th European MOOCs Stakeholders Summit (Madrid, Spain, May 22–26, 2017)* (eds C. Delgado Kloos, P. Jermann, M. Pérez-Sanagustin, D. T. Seaton, S. White), pp. 176–181.

Elizaryeva J. (2016) Sovremenny prepodavatel v protsesse «MOOKizatsii» obrazovaniya [Modern Instructor in the Process of «MOOCization» of Education]. *Humanitarian Informatics*, no 10, pp. 92–100.

Evans S., Myrick J. G. (2015) How MOOC Instructors View the Pedagogy and Purposes of Massive Open Online Courses. *Distance Education*, vol. 36, no 3, pp. 295–311.

Gil-Jaurena I., Domínguez D. (2018) Teachers' Roles in Light of Massive Open Online Courses (MOOCs): Evolution and Challenges in Higher Distance Education. *International Review of Education*, vol. 64, no 2, pp. 197–219.

Hew K. F., Cheung W. S. (2014) Students' and Instructors' Use of Massive Open Online Courses (MOOCs): Motivations and Challenges. *Educational Research Review*, no 12, pp. 45–58.

Jansen D., Konings L. (2017) MOOC *Strategies of European Institutions*. Available at: https://oerknowledgecloud.org/sites/oerknowledgecloud.org/files/MOOC_Strategies_of_European_Institutions.pdf (accessed 1 August 2019).

Lin J., Cantoni L. (2018) Decision, Implementation, and Confirmation: Experiences of Instructors behind Tourism and Hospitality MOOCs. *International Review of Research in Open and Distance Learning*, vol. 19, no 1, pp. 1–293.

Literat I. (2015) Implications of Massive Open Online Courses for Higher Education: Mitigating or Reifying Educational Inequities? *Higher Education Research and Development*, vol. 6, no 34, pp. 1164–1177.

Liyanagunawardena T. R., Adams A. A., Williams S. A. (2013) MOOCs: A Systematic Study of the Published Literature 2008–2012. *The International Review of Research in Open and Distributed Learning*, vol. 14, no 3, pp. 202–227.

Lowenthal P. R., Snelson C., Perkins R. (2018) Teaching Massive Open Online Courses (MOOCs): Tales from the Front Line. *International Review of Research in Open and Distance Learning*, vol. 19, no 3, pp. 1–19.

Malkova I., Babanskaya O., Zakharova U., Ryltseva E., Mozhaeva G., Tanasenko K. (2018) Identifying Competencies for Taking Online Courses Successfully. INTED2018 Proceedings of the *12th International Technology, Education and Development Conference (Valencia, Spain, March 5–7, 2018)*, pp. 0575–0581.

Margaryan A., Bianco M., Littlejohn A. (2015) Instructional Quality of Massive Open Online Courses (MOOCs). *Computers and Education*, no 80, pp. 77–83.

Mozhaeva G. (2016) MOOC v izuchenii i prepodavanii istorii: k voprosu o vozmozhnostyakh i perspektivakh [MOOCs in Learning and Teaching History: Revising the Opportunities and Prospects]. Istoricheskie issledovaniya v tsifrovuyu epokhu: informatsionnye resursy, metody, tekhnologii [Historical Research in the Digital Era: Information Resources, Methods, and Technology]. Proceedings of the *15th International Conference of the History and Computer Association (Moscow—Zvenigorod, October 7–9, 2016)*, Moscow: MAKS, pp. 237–238.

Mozhei K., Lukianov D. (2017) Aspekty prakticheskoy realizatsii massovykh otkrytykh onlayn-kursov v obrazovatelnom protsesse vysshego uchebnogo zavedeniya [Aspects of Practical Implementation of Massive Open Online Course in the Educational Process of a Higher Educational Institution]. Aktualnye problemy gumanitarnogo obrazovaniya [Pressing Issues in Humanities Education]. Proceedings of the *14th International Research-to-Practice Conference (Novosibirsk, November 15–December 13, 2017)*, Minsk: Belarusian State University, pp. 41–45.

Ospina-Delgado J., García-Benau M.A., Zorio-Grima A. (2016) Massive Open Online Courses for IFRS Education: A Point of View of Spanish Accounting Educators. *Procedia—Social and Behavioral Sciences*, no 228, pp. 356–361.

Roshchina J., Roshchin S., Rudakov V. (2018) Spros na massovye otkrytye onlayn-kursy (MOOC): opyt rossiyskogo obrazovaniya [The Demand for Massive Open Online Courses (MOOC): Evidence from Russian Education]. *Voprosy obrazovaniya / Educational Studies Moscow*, no 1, pp. 174–199. DOI: 10.17323/1814–9545–2018–1–174–199

Ulrich C., Nedelcu A. (2015) MOOCs in Our University: Hopes and Worries. *Procedia—Social and Behavioral Sciences*, no 180, pp. 1541–1547.

Vaganova N., Telegina O. (2017) Integratsiya massovykh otkrytykh onlayn-kursov (MOOK) v protsess obucheniya angliyskomu yazyku studentov zaochnogo otdeleniya [Massive Open Online Course (MOOC) Integration in English to Distance Learning Students]. Teoriya i metodika obucheniya i vospitaniya v sovremennom obrazovatelnom prostranstve [Theory and Methods of Instruction and Education in Modern Learning Environments]. Proceedings of the *2nd International Research-to-Practice Conference (Novosibirsk, November 15–December 13, 2017)*, Novosibirsk: Center for Global Cooperation Development, pp. 123–128.

Veletsianos G., Shepherdson P. (2016) A Systematic Analysis and Synthesis of the Empirical MOOC Literature Published in 2013–2015. *International Review of Research in Open and Distance Learning*, vol. 17, no 2, pp. 198–221.

World Economic Forum (2018) The Global Competitiveness Report 2018. Available at: https://www.weforum.org/reports/the-global-competitveness-report-2018 (accessed 1 August 2019).

World Economic Forum (2017) The Global Human Capital Report 2017. Available at: https://www.weforum.org/reports/the-global-human-capital-report-2017 (accessed 1 August 2019).

Zheng S., Wisniewski P., Rosson M. B., Carroll J. M. (2016) Ask the Instructors: Motivations and Challenges of Teaching Massive Open Online Courses. Proceedings of the *19th* ACM *Conference on Computer-Supported Cooperative Work & Social Computing*—CSCW *'16*, pp. 205–220.

Zhuk L. (2016) Inoyazychnye massovye otkrytye onlain-kursy kak odin iz vidov vneauditornoy samostoyatelnoy raboty studentov [Foreign Massive Open Online Courses as a Type of Students' Independent Work]. *Voprosy metodiki prepodavaniya v vuze*, no 5 (19–1), pp. 235–243.

Psychological Well-being in First- to Fifth-Graders in the Context of Contemporary Social Situation of Development

Authors **Alla Andreeva**
Candidate of Sciences in Psychology, Senior Research Fellow, Head of The Science of Practical Child Psychology Laboratory, Psychological Institute (Federal State Budgetary Scientific Institution), Russian Academy of Education. E-mail: alladamirovna@yandex.ru

Olga Moskvitina
Candidate of Sciences in Psychology, Associate Professor, The Science of Practical Child Psychology Laboratory, Psychological Institute (Federal State Budgetary Scientific Institution), Russian Academy of Education. E-mail: mskvn-lg@yandex.ru

Address: Bld. 4, 9 Mokhovaya Str., 125009 Moscow, Russian Federation.

Abstract Psychological well-being of children in elementary school and during the transition to middle school is analyzed in the sociocultural context of the post-industrial society from the perspective that Russian psychology has on the social situation of development, its objective and subjective components, and its influence on school students' educational outcomes and mental health. Level of aspiration, self-esteem and age satisfaction serve as integral indicators of students' psychological well-being in this study, providing the basis for judging whether the social situation of development meets children's age-specific needs. The method of comparative-historical research allows observing the dynamics of a child's psychological life as a function of the social situation of development. It is shown that the age structure of both self-esteem and the level of aspiration in contemporary first- to fifth-graders differs dramatically from that of their age-mates observed in studies of the last quarter of the 20th century, while age satisfaction has remained positive throughout the age period analyzed. Age crises adequate to the current social situation of development are found to bring down all the analyzed parameters of school students' psychological well-being in Grade 4, which then rebound in Grade 5. The findings illustrate psychological well-being of contemporary school students in the context of the drastically changing social situation of development of the post-industrial society. Some gender differences have been observed in psychological readiness for middle school. The temporal structure of age satisfaction shows that girls prefer retaining their familiar social position in the teacher–student system, while boys experience the end of elementary school as a crisis of relationship that cannot foster their personal development anymore.

Keywords psychological well-being, social situation of development, post-industrial society, school students, comparative-historical approach, self-esteem, level of aspiration, age satisfaction.

References Ananiev B. (1980) Problemy sovremennogo chelovekoznaniya [The Problems of Contemporary Study of Human Nature]. *B. G. Ananyev. Izbrannye psikhologicheskie trudy: v 2 t.* [Boris Ananiev. Selected Psychological Works in Two Volumes] (eds A. Bodalev et al.), Moscow: Pedagogika, vol. 1.

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

Chesnokova I. (1977) *Problema samosoznaniya v psikhologii* [The Problem of Self-Consciousness in Psychology]. Moscow: Nauka.

Csikszentmihalyi M. (2011) *V poiskakh potoka: psikhologiya vklyuchennosti v povsednevnost* [Finding Flow. The Psychology of Engagement of Everyday Life]. Moscow: Alpina non-fiction.

Csikszentmihalyi M. (2013) *Potok: psikhologiya optimalnogo perezhivaniya* [Flow. The Psychology of Optimal Experience]. Moscow: Alpina non-fiction.

Dembo T. (1962) *Prisposoblenie k uvechyu—problema sotsialno-psikhologicheskoy reabilitatsii* [Adjustment to Misfortune: A Problem of Social-Psychological Rehabilitation] (manuscript, translated from English). Moscow State University Archives.

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

Diener E., Suh E. M., Lucas R. E., Smith H. L. (1999) Subjective Well-Being: Three Decades of Progress. *Psychological Bulletin*, vol. 125, no 2, pp. 276–302.

Dubrovina I. (2018) *Psikhologicheskoe blagopoluchie shkolnikov: ucheb. posobie dlya bakalavriata i magistratury* [Psychological Well-being of School Students: Study Guide for Bachelor's and Master's Degree Students]. Moscow: Urait.

Elkonin D. (1998) *Psikhologiya obucheniya mladshego shkolnika* [The Psychology of Teaching Elementary School Children]. Moscow: Znanie.

Hamamura T., Septarini BG. (2017) Culture and Self-Esteem over Time: A Cross-Temporal Meta-Analysis among Australians, 1978–2014. *Social, Psychological and Personality Science*, vol. 8, no 8, pp. 904–909.

Helwig N. E., Ruprecht M. R. (2017) Age, Gender, and Self-Esteem: A Sociocultural Look through a Nonparametric Lens. *Archives of Scientific Psychology*, vol. 5, no 1, pp. 19–31.

Karabanova O. (2007) "Sotsialnaya situatsiya razvitiya" v sovremennoy psikhologii ["Social Situation of Development" in Contemporary Psychology]. *Methodology and History of Psychology*, vol. 2, iss. 4, pp. 40–56.

Leontiev A. (1975) *Deyatelnost. Soznanie. Lichnost* [Activity, Consciousness, and Personality]. Moscow: Politizdat.

Leontiev D. (2005) Neklassicheskiy vektor v sovremennoy psikhologii [The Non-Classical Vector in Contemporary Psychology]. *Postneklassicheskaya psikhologiya: sotsialny konstruktsionizm i narrativny podkhod*, no 1, pp. 51–71.

Lipkina A. (1976) *Samootsenka shkolnika* [School Student's Self-Esteem]. Moscow: Znanie.

Lisina M. (1980) Formirovanie lichnosti rebenka v obshchenii [Development of Child's Personality through Communication]. *Psikhologo-pedagogicheskie problemy stanovleniya lichnosti i individualnosti v detskom vozraste* [Psychological and Pedagogical Problems of Personality and Identity Development in Childhood] (eds V. Davydov, I. Dubrovina). Moscow: National Research Institute of General Pedagogy, pp. 36–46.

Prikhozhan A. (2007) *Diagnostika lichnostnogo razvitiya detey podrostkovogo vozrasta* [Monitoring the Personal Development of Adolescents], Moscow: Electronic Library of Psychology, Autonomous Noncommercial Organization.

Ryff C. D. (1996) Psychological Well-Being. *Encyclopedia of Gerontology: Age, Aging, and the Aged* (ed. J. E. Birren), San Diego, CA: Academic Press, pp. 365–369.

Seligman M. (2012) *Flourish: A Visionary New Understanding of Happiness and Well-Being*. New York: Atria Books.

Shayakhmetova V. (2015) Issledovanie formirovaniya samootsenki mladshikh shkolnikov [Study of Self-Esteem Formation of Younger Teenagers]. *Koncept*, no 3, pp. 66–70.

Shayakhmetova V., Minkh G. (2015) Uroven samootsenki mladshikh podrostkov v period adaptatsii pri perekhode iz mladshego shkolnogo zvena v srednee [The Level of Self-Esteem of Teenagers during the Period of Adaptation in the Transition from Primary School Level to Secondary]. *Koncept*, no 1, pp. 71–75.

Shumakova N. (2016) Kreativnost i samootsenka v period perekhoda uchashchikhsya iz nachalnoy v srednyuyu shkolu [Creativity and Self-Esteem during the Transition of Students from Primary to Secondary School]. *Theoretical and Experimental Psychology*, vol. 9, no 4, pp. 53–62.

Vaillant G. E. (1995) *Adaptation to Life*. Cambridge, MA: Harvard University.

Vaillant G. E. (2002) *Aging Well*. Boston: Little Brown.

Vygotsky L. (2000) Problema vozrasta [The Problem of Age]. *Vygotsky L. Psikhologiya* [Psychology], Moscow: Eksmo-Press, pp. 892–997.

Zakharova A. (1998) *Genezis samootsenki* [The Genesis of Self-Esteem]. Tula: Tula State Lev Tolstoy Pedagogical University.

Zakharova A., Andrushchenko T. (1980) Issledovanie samootsenki mladshego shkolnika v uchebnoy deyatelnosti [Research on Elementary School Students' Self-Esteem in Learning]. *Voprosy psychologii*, no 4, pp. 90–99.

Age Peculiarities of Taking Initiative in Learning among Preschool Children

Authors

Ekaterina Klopotova
Candidate of Sciences in Psychology, Associate Professor, Chair of Preschool Pedagogy and Psychology, Department of Developmental Psychology, Moscow State University of Psychology and Education. E-mail: klopotova@yandex.ru

Elena Yaglovskaya
Candidate of Sciences in Psychology, Professor, Chair of Preschool Pedagogy and Psychology, Department of Developmental Psychology, Moscow State University of Psychology and Education. E-mail: yaglovskaya_ek@mail.ru

Address: 29 Sretenka Str., 127051 Moscow, Russian Federation.

Abstract

The article presents the results of an experimental study designed to identify the age peculiarities of taking initiative in learning among preschool children. Empirical data was obtained through non-participant observation of a teacher-guided group of children performing various productive tasks. A total of 480 preschoolers aged between 3 and 7 years were observed. Since teacher-guided peer learning prevails in preschool classrooms, we assume that child initiative could be determined as behaviors directed at co-participants in such learning. In this study, children's initiative during interaction with adults and peers is defined as questions and suggestions that children raise in connection to the learning process, instigated by the need to coordinate joint actions. Analysis of the empirical data obtained allows determining the age dynamics and age-specific characteristics of preschoolers taking initiative while interacting with teachers. The number of self-initiated statements made by children is found to decrease and change in both direction and content throughout the preschool years.

Keywords

preschool education, initiative taking in children, interaction with adults, peer learning, self-initiated statements.

References

Alieva T., Uradovskikh G. (2015) Detskaya initsiativa—osnova razvitiya poznaniya, deyatelnosti, kommunikatsii [Children's Initiative—the Basis of the Development of Cognition, Activities, Communication]. *Preschool Education*, no 9, pp. 113–119.

Alieva T., Uradovskikh G., Arnautova E., Nekhoroshkina O. (2014) "Zhivye" praktiki podderzhki detskoy initsiativy ["Live" Practices of Encouraging Children's Initiative]. *Uchitelskaya Gazeta*, no 29.

Andreeva T. (2014) *Semeynaya psikhologiya* [Family Psychology]. St. Petersburg: Rech.

Bogoyavlenskaya D. (1983) *Intellektualnaya aktivnost kak problema tvorchestva* [Intellectual Activity as a Problem of Creativity]. Rostov-on-Don: Rostov State University.

Elkonin D. (ed.) (2007) *Detskaya psikhologiya: ucheb. posobie dlya stud. vyssh. ucheb. zavedeniy* [Child Psychology: Study Guide for College Students]. Moscow: Akademiya.

Erikson E. (1996) *Detstvo i obshchestvo* [Childhood and Society]. St. Petersburg: Piter.

Hakkarainen P., Bredikyte M. (2010) Obuchenie, osnovannoe na igre, kak nadezhny fundament razvitiya [Strong Foundation through Play-Based Learning]. *Psychological Science and Education*, no 3, pp. 71–79.

Kalinina P. (2004) Diagnostika roditelskoy pozitsii [Assessing the Parental Position]. *Sbornik nauchnykh statey prepodavateley Pskovskogo Volnogo instituta* [Collected Research Articles by Pskov Volny Institute Professors] (eds R. Kalinina, R. Saneva), Pskov: Pskov Volny Institute, pp. 37–38.

Kolesnikova T., Pugacheva L. (2017) K voprosu o detskoy initsiative i samostoyatelnosti v proektnoy deyatelnosti doshkolnikov [Revisiting Initiative and Autonomy in Preschoolers' Project Activities]. *Problemy nauchnoy mysli*, vol. 8, no 1, pp. 24–27.

Korotkova N., Nezhnov P. (2017) *Nablyudenie za razvitiem detey v doshkolnykh gruppakh* [Observing Child Development in Preschool Classrooms]. Moscow: Linka-Press.

Lavrentyeva T. (ed.) (2002) *Psikholog v doshkolnom uchrezhdenii: metodicheskie rekomendatsii k prakticheskoy deyatelnosti* [Psychologist in a Preschool Educational Institution: Methodological Recommendations for Professional Practice]. Moscow: Gnom i D.

Lisina M. (1986) *Problemy ontogeneza obshcheniya* [The Problems of Communication Ontogenesis]. Moscow: Pedagogika.

Petrova N., Trandina O. (2017) Formirovanie initsiativy i samostoyatelnosti u detey mladshego doshkolnogo vozrasta cherez rechevoe razvitie, metodom proektnoy deyatelnosti [Fostering Initiative and Autonomy in Early Childhood through Language Development Using the Project Method of Teaching]. Aktualnye voprosy sovremennoy pedagogiki [Pressing Issues of Modern Pedagogy]. Proceedings of the *10th International Scientific Conference (Samara, Russian Federation, March 20–23, 2017)*, pp. 55–57.

Petrovsky V. (ed.) (1994) *Vospitateli i deti: istochniki rosta. Posobie dlya metodistov doshkolnogo i nachalnogo shkolnogo obrazovaniya, prepodavateley, psikhologov* [Preschool Teachers and Children: Sources of Growth. Guidelines for Preschool and Elementary School Instructional Designers, Teachers, and Psychologists]. Moscow: Aspekt Press.

Petrovsky V. (1996) *Lichnost v psikhologii: paradigma subyektnosti* [Personality in Psychology: The Agency Paradigm]. Rostov-on-Don: Feniks.

Sidorenko E. (2001) *Metody matematicheskoy obrabotki v psikhologii* [Mathematical Treatment Methods in Psychology]. St. Petersburg: Rech.

Smirnova E. (2016) Usloviya formirovaniya i podderzhki detskoy initsiativy v detskom sadu [Prerequisites for Cultivating and Supporting Children's Initiative in Kindergarten]. *Detskiy sad: Teoriya i praktika*, no 6 (66), pp. 18–31.

Udova O., Chapchikova O. (2016) Osobennosti podderzhki initsiativy doshkolnikov v spetsificheskikh vidakh detskoy deyatelnosti [Encouraging Initiative in Preschoolers Across Specific Types of Children's Activities]. *Detskiy sad: Teoriya i praktika*, no 6 (66), pp. 44–53.

Yustus T. (2014) Obrazovatelnye usloviya stanovleniya initsiativnosti doshkolnikov [Educational Factors Promoting the Development of Proactive Behavior]. *Vospitanie i obuchenie detey mladshego vozrasta*, no 2, pp. 28–29.

Zuckerman G. (2007) O podderzhke detskoy initsiativy [Supporting Children's Initiative]. *Kulturno-istoricheskaya psikhologiya [Cultural-Historical Psychology*], no. 1, pp. 41–55.

Zuckerman G., Elizarova N. (1990) O detskoy samostoyatelnosti [On Children's Autonomy]. *Voprosy psychologii*, no 6, pp. 10–21.

Do School Social Studies Textbooks Need to Be Changed?

Authors

Elena Chernobay
Doctor of Sciences in Pedagogy, Professor, Professor of the Department of Educational Programms, Institute of Education, National Research University Higher School of Economics. E-mail: echernobaj@hse.ru

Daria Tuchkova
Analyst, Center for the Study of 21st Century Curricula and Teaching Practices, Institute of Education, National Research University Higher School of Economics. E-mail: d.tuchkova@yandex.ru

Address: 20 Myasnitskaya Str., 101000 Moscow, Russian Federation.

Abstract

Expected learning outcomes have changed following the adoption of the new Federal State Educational Standards of General Education. New organizational forms, teaching methods and tools are required to achieve the new learning outcomes, which affects functionality of conventional learning aids, school textbooks in particular. New interrelation mechanisms are being developed between the textbook and the other components of learning environment, transforming the textbook from the "communicator of ready-to-consume knowledge" into a "navigator for independent learning". Under such circumstances, it is important to evaluate teachers' attitudes towards the textbooks used, their perception of the changing role of textbooks in the learning process, and their satisfaction with textbook content, namely the methodological apparatus and its potential for achieving the new learning outcomes.

This article presents the results of a survey assessing school teachers' perceptions of the system of learning tasks in some widely assigned social studies textbooks from the series edited by Leonid Bogolyubov, Anatoly Nikitin and Tatyana Nikitina, Gennady Bordovsky, and Yevgeniya Korolkova. The survey covered thirteen regions of the Russian Federation: Moscow Oblast, Voronezh, Tambov, Bryansk, Tver, Smolensk, Omsk, Krasnoyarsk, Rostov-on-Don, Volgograd, Kazan, Nizhny Novgorod, and Saransk. The interview questionnaire included six themed modules: target audience profile analysis, teachers' usage of different textbooks, the role of social studies textbooks in the learning process, textbook influence on the achievement of the new learning outcomes (formation of key 21st century competencies), teachers' assessment of teaching guidebooks, and availability of social studies teaching packages in schools.

The article only explores the findings obtained for one questionnaire module, which explored how the methodological apparatus of social theory textbooks affected the creation of conditions for achieving metadisciplinary learning outcomes by school students, and offers recommendations on improving this apparatus.

Keywords

teacher, school, learning process, textbook, textbook methodology, system of learning tasks, new learning outcomes, metadisciplinary learning outcomes.

References

Andreeva G., Vyalikova G., Tyutkova I. (2005) *Kratkiy pedagogicheskiy slovar: Uchebnoe spravochnoe posobie* [A Short Dictionary of Pedagogical Terms]. Moscow: Sekachev, Institute of Basic Research in Humanities.

Avdulova T. (2010) Podrostki v informatsionnom prostranstve [Adolescents in the Information Environment]. *Psikhologiya obucheniya*, no 4, pp. 28–38.

Beilinson V. (1986) *Arsenal obrazovaniya: kharakteristika, podgotovka, konstruirovanie uchebnykh izdaniy* [Arsenal of Education: Characteristics, Preparation, Design of Educational Publications]. Moscow: Kniga.

Efremov K. (2007) Trud i deti—novye otnosheniya [Labor and Children: A New Relationship]. *Vospitatelnaya rabota v shkole*, no 6, pp. 25–30.

Feigenberg J. (2014) *Uchimsya vsyu zhizn* [Learning Throughout Life]. Moscow: Smysl.

Golinkoff R. M., Hirsh-Pasek K. (2018) *Znat ili umet? Shest klyuchevykh navykov sovremennogo rebenka* [Becoming Brilliant. What Science Tells Us About Raising Successful Children]. Moscow: Mann, Ivanov i Farber.

Kondakov A., Kuznetsov A. (eds.) (2008) *Kontseptsiya federalnykh gosudarstvennykh obrazovatelnykh standartov obshchego obrazovaniya* [The Concept of Federal State Educational Standards of General Education]. Moscow: Prosveshchenie.

Kondrashkin A. (2013) Internet v razvitii sovremennykh podrostkov [Role of the Internet in the Development of Modern Teenagers]. *Psychological-Educational Studies*, no 2, pp. 114–134.

Lysichenkova S. (2012) Vliyanie osobennostey sovremennykh shkolnikov na ikh poznavatelnuyu motivatsiyu [The Influence of Contemporary School Students' Peculiarities on Their Cognitive Motivation]. *Molodoy ucheny*, no 4, pp. 428–431.

Markushevich A. (1974) *Razmyshleniya o sudbakh uchebnika. Problemy shkolnogo uchebnika* [Reflecting on the Prospects of Textbooks. The Problems of School Textbooks]. Moscow: Prosveshchenie.

Oudenhoven N. van, Wazir R. (2010) *Novoe detstvo: kak izmenilis usloviya i potrebnosti zhizni detey* [Newly Emerging Needs of Children: An Exploration]. Moscow: Universitetskaya kniga.

Polivanova K. (2016) Detstvo v menyayushchemsya mire [Childhood in a Changing World]. *Journal of Modern Foreign Psychology*, vol. 5, no 2. pp. 5–10.

Sobkin V. (2006) Transformirovanie tseley i motivatsii ucheby shkolnikov [Transforming the Goals and Academic Motivations of School Students]. *Sociological Studies*, no 8, pp. 106–115.

Steinberg L. (2017) *Perekhodny vozrast. Ne upustite moment* [Age of Opportunity. Lessons from the New Science of Adolescence]. Moscow: Mann, Ivanov i Farber.

Zuev D. (1983) *Shkolny uchebnik* [The School Textbook]. Moscow: Pedagogika.

Zuev D. (ed.) (2004) *Problemy shkolnogo uchebnika:* XX *vek: Itogi* [The Problems of School Textbooks: 21st Century: Outcomes]. Moscow: Prosveshchenie.

The Catalogues of Textbooks for Secondary Schools of the Ministry of Public Education: On the Issue of Their Introduction (1830s—1860s)

Authors

Tatiana Pashkova
Candidate of Sciences in History, Associate Professor, History and Social Sciences Department, the Herzen State Pedagogical University of Russia. E-mail: tatianapashkova22@gmail.com

Ekaterina Kameneva
The third-year student, History and Social Sciences Department, the Herzen State Pedagogical University of Russia. E-mail: kameneva.katya777@gmail.com

Egor Karasev
The third-year student, History and Social Sciences Department, the Herzen State Pedagogical University of Russia. E-mail: karasev. e. a.2ip@gmail.com

Nikita Kutsevalov
The third-year student, History and Social Sciences Department, the Herzen State Pedagogical University of Russia. E-mail: rainnick0@gmail.com

Darya Russkova
The third-year student, History and Social Sciences Department, the Herzen State Pedagogical University of Russia. E-mail: dascha.loli@yandex.ru

Address: 48 Reki Mojki Naberezhnaya, 191186, Saint Petersburg, Russian Federation.

Abstract

The article is devoted to the study of the prerequisites and historical context of the emergence of a special type of official documentation of the Ministry of Public Education of the Russian Empire—catalogues of textbooks for secondary schools. The lists of study guides and manuals approved by the Ministry have become an important control instrument of the teaching of school subjects. Their content and structure were drawn up gradually from about the 1830s. An important stage in the process of reviewing and cataloging textbooks has been reached in 1865, when the first complete catalogue appeared, based on new rules.

Keywords

history of education, study manuals, schoolbooks, textbooks catalogs, Ministry of Public Education, Scientific Committee.

References

Borzykh N. (2014) Istochnikovaya osnova izucheniya dorevolutsionnogo shkolnogo uchebnika otechestvennoy istorii [Source Basis of Study of Pre-Revolutionary School-Book on National History]. *Vestnik of Samara State University*, no 9 (120), pp. 78–83.

Fuks A. (2017) *Shkolnye uchebniki po otechestvennoy istorii kak istoriograficheskiy fenomen (konets* XVII *v.—vtoraya polovina 1930-kh gg.)* [School Textbooks on National History as a Historiographic Phenomenon (Late 17th Century—the Second Half of the 1930s)]. Moscow: Informatsionno-isdatelskoe upravlenie of the MRSU.

Georgievsky A. (1902) *K istorii Uchenogo Komiteta Ministerstva narodnogo prosveshcheniya* [To the History of the Scientific Committee of the Ministry of Education]. Saint-Petersburg: Printing House of the Senate.

Goncharov M. (2013) Ucheny komitet Ministerstva narodnogo prosveshcheniya i ego rol v upravlenii obshchim i pedagogicheskim obrazovaniem Rossiiskoy imperii v XIX v. [The Scientific Committee of the Ministry of Education and Its Role in the Organization and Management of General and Pedagogical Education of the Russian Empire in the 19th Century]. *Science and School*, no 1, pp. 185–189.

Orlovskiy A. (2002) *Shkolnye uchebniki po russkoy istorii v Rossii v kontse* XIX—*nachale* XX *v. (opyt sozdaniya i metodicheskogo postroeniya)* [School Textbooks on Russian History in Russia in the Late 19th—Early 20th Century (Experience of the Creation and Methodical Construction)] (PhD Thesis). Moscow: Moscow Pedagogical State University.

Patrusheva N. (2013) Komitet rassmotreniya uchebnykh rukovodstv (1850–1856 gg.) [Committee for the Consideration of Educational Manuals (1850–1856)]. *Trudy Sankt-Petersburgskogo gosudarstvennogo universiteta kultury i iskusstv*, vol. 201, pp. 20–26.

Ponikarova N. (2005) *Ministerstvo narodnogo prosveshcheniya i shkolnoe obrazovanie po russkoy istorii. 1864–1917* [Ministry of Public Education and School Education in Russian History. 1864–1917] (PhD Thesis). Moscow: Lomonosov Moscow State University.

Rozhdestvensky S. (1902) *Istoricheskiy obzor deyatelnosti Ministerstva narodnogo prosveshcheniya. 1802–1902.* [Historical Overview of Activities of the Ministry of Public Education. 1802–1902]. Saint-Petersburg: Ministry of Public Education.

Studenikin M. (2016) *Metodika prepodavaniya istorii v russkoн shkole* XIX—*nachala* XX *v.* [Methods of History Teaching in the Russian School of the 19th—Early 20th Century]. Moscow: Prometei.

Teleshov S. (2011) Ministerstvo narodnogo prosveshcheniya i ego Ucheny komitet [The Scholarly Committee of the Public Education Ministry]. *Izvestia: Herzen University Journal of Humanities & Science*, no 139, pp. 97–105.

How “Different School” Will Change the World

Review of the book: Murashev A. Different School. Where Normal People Come From

Author **Alexey Lyubzhin**

Doctor of Sciences in Philology, Research Fellow at the Department of Rare Books and Manuscripts of the Science Library, Moscow State University. Address: 9 Mokhovaya Str., 103073 Moscow, Russian Federation. E-mail: vulture@mail.ru

Abstract The article speculates on the concept of “different school”, as illustrated by Alexander Murashev through the example of certain teachers, schools, school networks and systems that he studied by means of personal visits and face-to-face interviews with employees and students. The school model proposed by the author could take its small but rightful place in a schooling system that offers a choice of education patterns. “Different school” is a good option for highly sensitive children who shrink from facing the harsh social reality of regular schools and have limited ambitions and capabilities. However, as the only schooling system available, or even as a regular one, this model would have huge unwanted effects.

Keywords conventional schooling, new schooling, easy schooling, knowledge, skills, disciplines, interest, inquisitiveness, comprehension.