

How Can Education Become the Driving Force of Socioeconomic Development?

Russian
Education:
Achievements,
Challenges and
Prospects

Editors

Yaroslav Kuzminov

Isak Froumin

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BECOME THE DRIVING FORCE
OF SOCIOECONOMIC
DEVELOPMENT?**

HSE UNIVERSITY
Institute of Education

RUSSIAN EDUCATION: ACHIEVEMENTS, CHALLENGES AND PROSPECTS

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Yaroslav Kuzminov and Isak Froumin



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Edited by Yaroslav Kuzminov,
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Translated from Russian by Daniil Dynin



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SERIES EDITORS' PREFACE

We are pleased to offer readers this unique series of books, which combines analytical work across all levels of education with discussions of potential strategies for future development. These books reflect over two years of work by scholars from the Higher School of Economics (HSE) as well as the Center for Strategic Research (CSR).

In 2016, when the President of Russia tasked the CSR with drafting recommendations for accelerating the growth of living standards for Russian citizens, it became clear that human capital must be the core of any strategy for boosting economic growth. As the sphere in which this capital is formed, education becomes supremely important. A key question emerges here, posing a serious challenge to education researchers: “How can we take education from being just a government obligation to fueling the social and economic development of the country?” For Russia, with one of the world’s best education systems, this question is especially relevant today.

In making such demands on education, a theoretical framework is not enough. We must also carefully study the applied field of education, its achievements and shortcomings. No strategy can exist without a vision for the future and a vision of education’s role in the fabric of social development. Nor can there be a strategy without data, without an empirical view of education. That is why the HSE-CSR working group discussed not only principles, approaches, and best practices from around the world, but also organized numerous studies of education systems and conducted hundreds of discussions and interviews with practitioners and experts in the field. The series of books that resulted from this work begins with a volume that offers a new approach to human capital and a new role for education. It also discusses the fundamental mechanisms of education’s development. The volumes that follow are geared towards analysis

and reporting, breaking down the field of education into segments: preschool, primary and secondary, vocational, higher education, as well as children's after-school programs and continuing education. A special report is devoted to our analysis of the digital transformation of education, since we see this process as playing a key role in a fast-approaching civilizational shift.

We see each of the books in the series as being valuable in itself, and as being useful and interesting not only to education professionals but also to other interested readers. The books will be valuable to all those who don't want to limit themselves to their personal experience of education, but choose to go deeper into empirical data and theoretical arguments. These arguments and data come from researchers' work with publicly available resources, as well as from our own empirical studies. These studies include: Monitoring of Education Markets and Organizations (MEMO), the Longitudinal Panel Study of Educational and Occupational Trajectories, Household Socioeconomic Behavior Monitoring, and numerous other sociological, economic, pedagogical, and psychological studies.

However, we must acknowledge that the data presented and analyzed in this series contains a variety of flaws that certainly must be addressed in future work. First and foremost, most of our data points are averages and generalizations from the country as a whole, while regional differences are significant. A close study of differences among regions, as well as smaller areas, is needed to analyze data and study the interplay of economies and institutions more precisely in terms of regional typology. We were able to do this in numerous instances, but not nearly everywhere. The reason is simply a lack of available data that can be broken down regionally. The second flaw is a lack of data on the quality of education. The need here is even more urgent: such data is simply nonexistent for all levels of education except primary and secondary. We lack objective assessment tools, and the data we have from primary and secondary school assessment is closed off to study at the needed level of depth.

An important feature of this series is its immersion in the global context, driven by the task of making Russian education globally competitive. The reader will find here not only comparative statistics, but also analysis of global best practices in education development at all levels.

We are truly thankful for the work done by Alexei Kudrin, who led the drafting of recommendations for Russia-2024: The Strategy of Social and Economic Development; by Andrei Fursenko, assistant to the President of the Russian Federation; by all our partners in the federal and regional governments; and by all the various scholars and experts who worked with us. Thanks to all of them for the support, discussions, and suggestions.

This book both introduces the entire series and draws conclusions from it. Its authors try to consider the education system as a whole with all its levels, spheres and segments. They paint a detailed picture of the connections between education and other institutes (such as the labor and cultural markets) using a massive body of empirical data (including comparative international and interregional data) and the most authoritative contemporary socioeconomic theories. Such an approach enables them to make an evidence-based study of the education system not as a “thing-in-itself” but as the potential driving force of socioeconomic development of the country as a whole in a situation of fierce global competition. As this book shows, human capital shall be the main factor of success in this competition.

Yaroslav Kuzminov
Isak Froumin

EDITORS' PREFACE

While elaborating proposals for the Socioeconomic Development Strategy of the Russian Federation until 2024 with an Outlook to 2030, two related questions were posed to a group of education experts:

- *Can the education sphere serve as the driving force of socioeconomic development, understood not only as the growth of the GDP but also as a real improvement in the quality of life and standard of living of the population?*
- *What steps must be taken in education to attain the aforementioned goals and help the country to meet the corresponding challenges?*

Such questions were unexpected insofar as, when experts discuss the development prospects of the education system, they usually begin with problems faced by education itself. At best, the discussion examines “traditional” goals such as preparing specialists for a concrete sector of the modern economy. In contrast, the new perspective requires taking a different look at the system’s goals and development horizons, proceeding not so much from the goal of “preserving” the status quo as from objective societal demand for increasing the contribution of education to social development in the middle and long term.

- To this end, the CSR Education Working Group together with other expert teams set the goal of **studying the potential of the education segment in the following domains:**
- **qualitative and quantitative development of human capital in Russia for accelerating economic growth**
- **technological modernization**
- **augmenting social stability**
- **improving the country’s global rankings**

As of 2019, the urgency of this goal is enhanced by the fact that all four of these potential areas of the country’s development are

found (in a somewhat more detailed form) in six of the nine national development goals of the Russian Federation until 2024 set down in the Presidential Directive of May 7, 2018 (and in the package of national projects that were elaborated on the basis of these goals):

c) assuring the sustainable growth of the real incomes of citizens and the growth of state pensions at a faster rate than inflation;

d) halving the poverty rate in the Russian Federation;

f) accelerating the technological development of the Russian Federation and increasing the number of organizations engaged in technological innovations by 50%;

g) assuring the accelerated introduction of digital technologies into the economy and social sphere;

h) propelling Russia into the world's top 5 economies and assuring economic growth rates above the world average while preserving macroeconomic stability, including an inflation rate of 4% or less; and

i) creating a highly efficient export-oriented sector developing with the help of modern technologies and staffed with highly qualified personnel in the basic sectors of the economy, especially the processing industries and the agribusiness complex.

Education *can* and *must* make a decisive contribution to each of the six aforementioned areas, showing that it alone can play the role of the primary driving force of the sustainable progress of the Russian economy and society as a whole.

Such a view of education's role is based on the fact that the 21st century development of the global economy assigns an ever-greater role to human capital (human knowledge, skills, attitudes and competencies) — in particular, on account of the increasing production and use of high-tech knowledge and technologies.

This book examines in detail how education must develop to augment its contribution to the attainment of the aforementioned goals. The study is based on numerous conversations by the Center for Strategic Research with hundreds of experts for elaborating

and discussing the national goals and projects set out by the Russian President in 2018 and for preparing the report *Twelve Solutions for a New Education* published in April 2018.

The editors and authors would like to thank the following colleagues, discussions with whom played a key role in formulating the research questions and drawing the main conclusions:

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Editors' Preface

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Yaroslav Kuzminov
Isak Froumin
Pavel Sorokin

INTRODUCTION

The world is on the brink of revolutionary changes in life and the economy resulting from the emergence of new possibilities of human impact on nature and the development of digital technologies, bioengineering and new materials. One can say with a high degree of certainty that, ten years from now, at least 15% of existing jobs will disappear, totally new professions will emerge, and the content of work in all sectors of the economy will greatly change. Profound transformations will also occur in other areas of public life, including the cultural domain.

In today's world, the development of social systems is largely driven by the efforts and initiatives of individuals, which requires increasing social mobility and augmenting social solidarity. *In these conditions, education policy serves as a key factor of national competitiveness.* The education system is becoming one of the main investment resources in the world.

Russia has powerful educational potential that it largely inherited from the Soviet Union. Further achievements over the period 2000–2018 cast the foundations for the contribution of this sector to Russia's development. However, the transition to the new role of human capital will require major changes in all the areas of the existing education system, including areas that seem quite successful today.

On account of the shortage of modern highly productive jobs, *the high formal education potential of the Russian population is not being fully capitalized today.* In the group of countries with high tertiary education attainment, Russia has the lowest per capita GDP and labor productivity (Figs 1 and 2).

According to the report *Global Human Capital 2017* published by the World Economic Forum in September 2017,¹ Russia has the very

¹ <<https://www.weforum.org/reports/the-global-human-capital-report-2017>>.

high ranking of 4th in the world in human capital capacity (calculated primarily from education attainment indices for different levels of formal education) yet only 42nd in human capacity know-how measuring the real use of skills in labor activities. In the “availability of skilled workers,” Russia ranks 89th in the world.

These facts show that the country’s high formal education attainment has a low impact on economic and social processes.

Thus, the enormous human potential created by the Russian education system is not being converted into the well-being of the population. We teach a lot yet perhaps not the things people need to know to engage in productive work. The education system inculcates certain skills, knowledge and attitudes, yet they are either of insufficient quality (and thus do not generate economic growth) or are outdated from the start, being oriented not so much at the present as at the past.

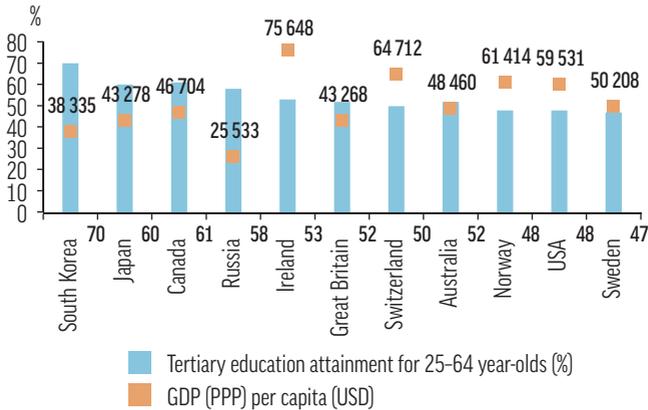
Without changing this situation, we will be unable to solve the problems of technological modernization, entrepreneurial development, social mobility, and talent acquisition in order to accelerate economic growth and improve the standard of living. In the conditions of economic sanctions and a difficult geopolitical situation, Russia has no possibility of accelerating economic growth other than to rely on itself and especially on its population, which, with the help of education, will be able to attain a higher standard of living and improve Russia’s competitiveness in the global arena.

The disproportion between high formal education attainment and low labor productivity can be explained, first and foremost, by Russia’s **weak economic institutions**. Low transparency, distorted business incentives, stifled competition, problems in attracting capital and credits, and the inefficiency of the labor market are just a few of the institutional hindrances to economic growth.

However, this does not mean that we should forget about modernizing education and simply focus on economic institutes. **Human capital has its own largely independent impact on economic development**. Poor institutions notwithstanding, the quantitative

Introduction

Figure 1. Tertiary Education Attainment (25-64 year-olds) and GDP Per Capita



Source: The World Bank.

Figure 2. Changes in the GDP Per Capita and Labor Productivity in Russia, 2003-2017



Source: Federal State Statistics Service of the Russian Federation.

growth and qualitative improvement of human capital can lead to better products and services and initiate the creation of new businesses and technological projects in different areas, including new sectors with higher labor productivity. Moreover, consumer demand for complex products and services (the “reflection” of human capital in the domain of consumption) can boost the economy.

At the same time, **human capital can contribute to the emergence and consolidation of new and more effective economic institutes.** An educated person learns new things more quickly and has higher expectations for legal mechanisms and greater opportunities for participating in governance.

Not surprisingly, critics who warned as far back as the 1970s that the rapid expansion of tertiary education in Western countries at a rate that outpaced the immediate demands of the labor market would lead to economic collapse turned out to be wrong [Schofer, Ramirez, Meyer, 2016; Smith, Welch, 1978; Dore, 1976; Berg, 1970; Schils, 1971]. University graduates created new niches on different markets (consulting, law, financial services, education, etc.) that not only met but also developed and expanded societal demand, making a substantial contribution to the GDP of developed countries. According to the International Labour Organization [Kuhn, Milasi, Yoon, 2018], the service sector will continue to grow internationally in upcoming years.

The transformation of economic institutions is a long-term process that does not simply depend on political and regulatory measures. As international experience shows, the time gap between changes in the behavior of the majority of economic agents and institutions and the appearance of results amounts to about 10 years. **In many cases, education reforms can yield much quicker results: the renewal of tertiary and vocational education will have an impact on Russia’s economic performance already by 2022–2023, while the modernization of upper secondary education will give results by 2025–2027.**

Introduction

Up to now, education policy in Russia has mostly focused on overcoming the internal problems of the education system (based on the notion that education is one of the government's social obligations) rather than on its impact on the country's economic and social development. However, today one can (and should) meet the country's development challenges by making education contribute to economic growth, technological modernization, global competitiveness, and social stability. This is the only way to turn education spending into a high-yield investment into the future rather than a simple social obligation of the state. We are intentionally drawing the analogy with investments here: as a World Bank study shows, education is becoming the most attractive investment area from the standpoint of returns (the yield from one year of education in the world today is several times higher on average than the yield from investments in financial instruments or real estate) [Psacharopoulos, Patrinos, 2018]. However, the problem is that in Russia, just as many other countries, individual returns from education do not always lead to collective returns at a macrolevel for the country as a whole. This phenomenon has been called the "micro-macro paradox" [Pritchett, 2001]. It is due, among others, to the fact that educated tertiary graduates prefer jobs that allow them to get higher returns from already existing assets (e.g., lawyers) rather than to create new value directly (e.g., engineers). Recent data shows that a similar problem is faced by the main driving force of the world's economy — China [Yao, 2019].

How should the education system change to make a greater contribution to socioeconomic development at the macro level? To answer this question, the present book has been divided into an analytic section and a program section.

The analytic section discusses the formulation of the problem and key ideas about the possible contribution of education to the country's development. It reexamines the notion of human capital in connection with the truly colossal social, technological and cul-

tural changes at the national and global levels. The analytic section shows that the education sector can become not just a resource but the main driving force of development, making a vital contribution to economic growth, entrepreneurial activity, technological modernization and social mobility.

This section also examines the main development trends in education over the past 20 years. It shows that the goals of assuring the accessibility of education and its effectiveness (in the traditional sense) that were set in 2000 have been mostly met. From this standpoint, Russia has one of the most highly developed education systems in the world. Qualitative indicators have improved, too. This has cast a foundation not only for the next stage of development but also for a totally new role of education in the economy and the social and cultural spheres. Nevertheless, this will require changes in the organization of education and in its content.

Furthermore, the analytic section shows that, the considerable progress notwithstanding, the education system has a number of barriers that must be overcome to enable it to become the driving force of socioeconomic development. The most serious barriers preventing education from assuming this role include the system's technological backwardness, its obsolete infrastructure, the ageing and weak innovative potential of education personnel, the insufficient orientation at social mobility, and the low participation of society and business in modernizing education. However, the main problem continues to be underfinancing.

The program section consists of two chapters that present different development scenarios for education in order to meet the country's challenges in the medium term (until 2024) and long term (until 2030). The basic stance of the author team is that, in contrast to the preceding stage of education development, priority must be given today not only to institutional reforms in the organization and economics of education (we are not disputing their necessity) but also to concrete large-scale projects that would raise the system to a new

Introduction

level of quality and augment its contribution to the country's development. The proposed development areas overlap with existing federal education projects yet have broader content and temporal scope. Thus, the program section includes, on the one hand, a survey of the main proposed transformation areas of Russian education until 2030 and, on the other, an analysis of national projects in the context of these key education development areas (with an emphasis on the goal of socioeconomic development).

It should be said that education performs a whole series of major social and cultural functions in addition to driving socioeconomic development and creating human capital. It assures ties between generations, the cultural unity of society, and the self-realization of citizens, which is one of their constitutional rights. Nevertheless, the analysis and recommendations presented in this book focus on socioeconomic development. It does not pretend, therefore, to be exhaustive or to propose an all-encompassing strategy of education development.

The publication of this book does not aim to bring the discussion to a close. In contrast, we hope that its principal analytic conclusions, theoretical approaches and concrete recommendations will serve as a foundation for further debate.

Chapter 1

Education for 21st Century Growth: Conceptual Analysis of Opportunities, Problems and Prospects

1.1. Human Capital as the Key Factor of Socioeconomic Development in the 21st Century

Human capital has become a key factor of economic and social development in the 21st century. Investments in this domain can result in economic growth rates higher than the world average (about 3–4% annually), which is an essential prerequisite for improving Russia's global ranking in the conditions of international competition. The quality of human capital is determined, first and foremost, by the education system, while other factors such as healthcare, migration, and culture have a substantially smaller impact.

Human capital is knowledge, skills and attitudes that allow individuals to create economic value and other useful effects, surpassing initial investments and day-to-day expenditures, for themselves, their employers and society as a whole [Kuzminov, Froumin, 2018; Brian, 2007]. All of an individual's abilities can become capital when they are employed for useful productive activity.

Clearly, the key beneficiaries of human capital in contemporary society are individuals and their families.

We should emphasize that human capital is the ability not only to perform one's work successfully but also to improve and create jobs, organizations and forms of activity, i.e., “**entrepreneurial skills**” in the broad sense of the term. For the Russian economy with its imperfect institutions, the element of human capital has major significance, as it has the potential of institutionally reforming the business environment and social institutions in general. In recent decades, **intellectual capital** has become a key aspect of a country's human capital. As the ability to generate and assimilate innovations (a sort of economic projection of creative activity), intellectual capital plays a key role in economic modernization and the transition to new technological paradigms.

In the economy, qualitative and quantitative improvements in human capital fuel labor productivity, consumer demand and entrepreneurial activity. Thus, for contemporary economic theory, education is not simply an expenditure alongside welfare, pensions, civil service, defense and security but is, more importantly, a **sphere of investment** that has an impact on the rate of economic growth. Not surprisingly, World Bank data (2018) show that, already today, human capital constitutes almost half (48%) of Russia's national wealth, greatly surpassing its natural wealth (i.e., natural resources) [Lange et al., 2018].

Besides creating human capital as a key factor of 21st century economic development, education is itself a **growing economic sector**. The education services market is expanding. As the example of the most successful countries shows, education exports can amount to dozens of billions of dollars. According to *Forbes* (2018),¹ the volume of student loans exceeds \$1.5 trillion in the USA alone. Although

¹ <<https://www.forbes.com/sites/zackfriedman/2018/06/13/student-loan-debt-statistics-2018/#124b5b567310>>.

most basic education programs in Russia are free, the Russian education market is quickly growing in size. The annual revenues of Russia's biggest providers of education programs and services (universities, publishing houses and banks) attain billions of rubles.

Finally, education is the **principal instrument of promoting social equity** all over the world, as it gives an “equal start” to all citizens as well as providing special support to disadvantaged students. In conjunction with its **formative function** (which, in particular, serves to reproduce the cultural code and develop the values of solidarity and patriotism), education gives stability to social development and turns economic growth into a foundation for improving the quality of life for all social groups.

1.2. Development in the Context of Global Competition and Institutional Instability: Role of Human Capital

The importance of human capital is increasing in the 21st century due to the ever-greater role played by knowledge and innovations in the economy and the growing uncertainty of life [Armstrong, Westland, 2018]. Every country must use a broad range of instruments to succeed in the global competition. In recent decades, Russia has focused on financial and economic regulatory instruments. Despite considerable success in overcoming the financial crises of 1998, 2008 and 2014–2016, institutional financial and economic solutions are clearly insufficient: the economic growth rate in Russia has remained below the world average in recent years, whereas the economy is undoubtedly the main factor in global competition – social stability can never be attained without economic growth [Pérez-Moreno, Rodríguez, Luque, 2016].

Thus, **human capital plays a key role in responding to the challenges of global competition** [Hanushek, Woessmann, 2008; Abankina et al., 2018; Docquier, Machado, 2016]. The focus on human capital targets two factors simultaneously:

- First of all, the global trend in which **top countries** (and not just them) **are investing a lot in human capital (including education)**. Nevertheless, the returns on these investments greatly vary [OECD, 2018]. In other words, it does not simply suffice to “put more money in the system,” as international experience shows. One must carefully plan the concrete investment areas and mechanisms and the methods of attaining the expected results. Finally, one must receive the broad support of those who will directly participate in the implementation of new education policy (school teachers and directors, university and college professors, students and their families) [Andrews, 2013].
- Secondly, the Russian context, in which it has become particularly clear that all the other instruments have either been exhausted or are objectively limited. **The experience of the past 30 years has shown the meaninglessness of making institutional reforms in the economy without actively involving human capital.** The creation of “good” institutes “on paper” has not always led to the effective activities of economic and social agents “in practice” (Russia is not unique in this domain: similar problems are experienced by other developing economies such as Mexico and South Africa). **The potential of Russia’s traditional trump card in global competition – the export of hydrocarbons in different forms – has, most likely, already reached its maximum.** The world is moving towards alternative energy sources. It is no surprise that China, the world’s leading oil consumer, has officially set itself the goal of becoming the “greenest” economy in upcoming years.

Thus, **there is virtually no alternative to human capital as the recipe of success in the global competition.**

Without a doubt, **one must not neglect reforms in other domains, especially the public administration system and basic economic regulators** that largely determine the behavior of the

Russian labor market and hence economic growth (see, for example, [Gimpelson, Kapelyushnikov, Roshchin, 2017]). However, the basic stance of the authors of this book is that **the transformation of human capital can be a “cause” of effective forms of the labor market as much as their “effect.”**

A second key factor of socioeconomic development in the early 21st century is the **profound institutional instability of the modern world**, which makes it necessary to abandon attempts to create institutes “from above” (as rigid “rules of the game”) in favor of the creation of a favorable and friendly environment that is open to changing the rules of the game in order to respond quickly and successfully to new challenges of the rapidly changing world through initiatives “from below,” including innovative ventures [Gimpelson, Kapelyushnikov, Roshchin, 2017]. The main driving force of such initiatives can only be human capital.

It should be kept in mind that, in the present-day conditions of profound uncertainty and institutional instability, no one can identify all the characteristics of human capital that will play a major role in the socioeconomic development of society after the year 2030.

Thus, **the human capital of a society is an investment portfolio with a certain percent of high-risk assets.** Most likely, not all human investments will have a direct impact on economic growth. Nevertheless, the following factors must be kept in mind.

First of all, as the totality of international experience of the 20th and 21st centuries shows, **investments into human capital have positive net returns in the overwhelming majority of cases** (on the condition of a favorable institutional environment). A meta-survey of the results of hundreds of individual studies conducted by the World Bank [Psacharopoulos, Patrinos, 2018] shows that individual returns on education investments have not fallen in recent decades, constituting about 9% per year of study (mean value across all the countries included in the sample and all levels of education over the past 50 years).

Secondly, even if certain investments do not yield major financial returns, **the growing knowledge, competencies and positive motivation of Russian citizens are achievements in their own right that have an impact on the well-being of individuals and the legitimacy of the state as a whole.**

As the generator of human capital, the education sphere is best suited to play the role of a launch pad for transformational processes in other social sectors and the economy as a whole. This is particularly important in the conditions of the totally new and extremely complex civilizational context in which Russia and its competitors are searching for solutions to socioeconomic development problems. This context shall be examined in greater detail below.

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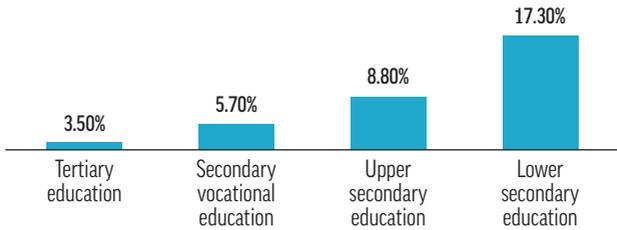
1.3.1. Why Has Russian Education Had a Limited Impact So Far? Principal Views

One can formulate a few general views on hindrances to the capitalization of human potential that have been voiced in public discussions about Russian education.

The first view can be described as “**too much education.**” Its gist is that the current education attainment of Russian citizens exceeds the demands of the economy. To support this thesis, one cites the shortage of workers in certain sectors as well as cases of “overeducated” people with tertiary degrees working as salespeople or drivers (which is, indeed, becoming increasingly common) [Gimpelson, 2016]. While the proponents of this view do not directly call for limiting education attainment and education spending, they express satisfaction with the recent increase in the percent of 9th-grade graduates going to vocational colleges (from 27% to 50%). Nevertheless, scholarly research does not corroborate the excessiveness of

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Figure 3. Unemployment rate by education attainment in Russia, 2016



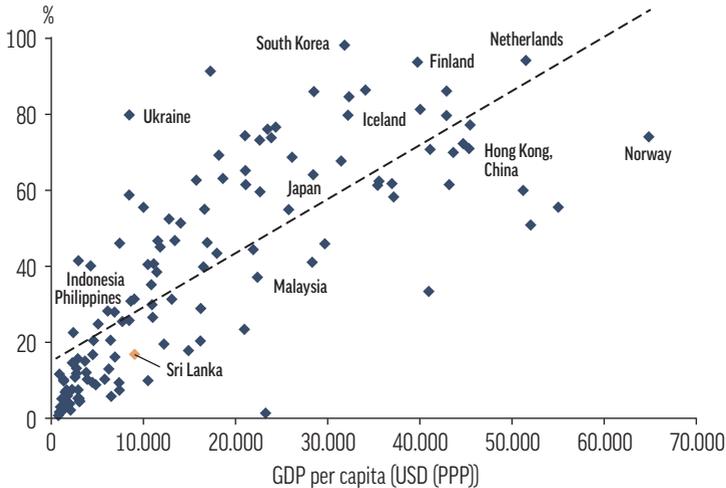
Source: Federal State Statistics Service of the Russian Federation.

investments in education. In 2016, specialists with tertiary degrees earned 1.5 times more on average than employees with only a school diploma. In contrast, a secondary vocational education gives virtually no salary bonuses over a general secondary education, which is an alarming sign. Higher education attainment also gives an advantage for job placement (Fig. 3): there are virtually no tertiary degree holders among the unemployed.

International experience does not corroborate this view, either. On the contrary, it shows a positive correlation between tertiary education attainment and economic growth. This is particularly evident in the upper and lower percentiles of country ratings: the wealthiest countries have the highest education attainment and vice-versa (Fig. 4).

The second view is that the **structure of Russian secondary vocational and tertiary education** is poorly suited for fueling economic growth. The adepts of this view believe that the education system produces too few engineers, agronomists, and other specialists of the “real economy” and too many economists, lawyers and managers. However, a comparison of the makeup of majors in Russia and other countries shows that the percent of tertiary students studying socioeconomic fields is virtually the same. At the same time, there are twice as many engineering graduates in Russia as in other countries, and a lot fewer students majoring in the natural sciences and

Figure 4. Relation between tertiary education attainment and economic growth



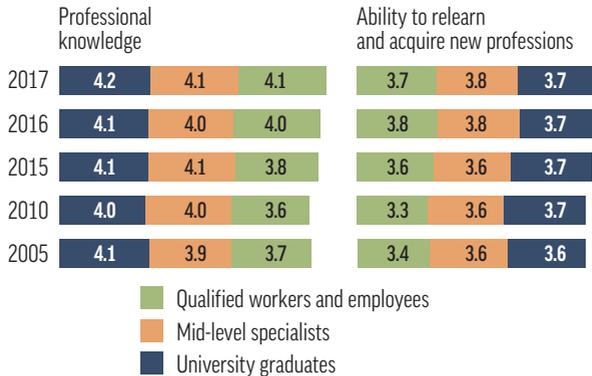
Source: The Societal Effects of Higher Education: Cross-National Analyses, 1960–2012.

humanities [Klyachko, 2017, pp. 18–20]. Employers in “real sectors” do not complain about a shortage of graduates with tertiary and upper secondary degrees yet speak about their insufficient professional knowledge and skills and their inability to relearn and acquire new professions (Fig. 5). Thus, the problem lies in the quality rather than the makeup of education and in the shortage of both specialized professional skills and broader competencies.

The third view stresses the **formal nature of education and the low involvement of citizens** in choosing and designing education trajectories (for themselves and their children). To all intents and purposes, students that enter the education system play the role of **executors of study programs that were developed without their participation**. This leads to the inactiveness of students and the low effectiveness of learning, i.e., a situation in which the goal of students (at all levels from school to university) is to obtain formal

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Figure 5. Employer ratings of the professional knowledge of graduates and their ability to relearn and acquire new professions on a five-point scale (in companies that have hired graduates in the past two years), 2017



Source: Monitoring of Education Markets and Organizations.

education certificates rather than knowledge and skills that would be useful to them. Such education is incapable of identifying and developing student skills and talents or designing successful education trajectories and thus has low social and economic impact.

This is particularly important given the need to make a rapid positive impact on the economy. The low activity of citizens after the completion of formal education cycles (upper secondary school, college or university) leads to their low involvement in informal (non-compulsory) study programs. The share of adults aged between 25 and 60 participating in any type of education is 2–3 times lower in Russia than in developed countries.^{2,3}

The individualization of education could solve the problems of the low motivation and alienation of students. As a principle, it was

² Statistical Bulletin *Training and Retraining for Education Workers in 2016*. 2017. Vol. 1.

³ Eurostat: Participation rate in education and training. <<http://ec.europa.eu/eurostat/statistics>>.

declared already in the first version of the Law on Education of 1992. However, this principle was never really implemented due to the difficult economic situation and the falling revenues of the state and citizens in the 1990s.

At the same time, it is clearly impossible to satisfy the demand for personalized education in full and always take the individual needs of students and the wishes of their families into account. Doing so would be much too costly. This is the hidden reason for abandoning individualization even in cases when it would be in the interests of society.

Although the above explanations of the low capitalization of human potential are important and well-substantiated, we believe that the principal solution lies less in adapting study fields to the needs of the labor market as in making the skills and attitudes inculcated by education correspond to the new development challenges of the economy and society. This problem is discussed in greater detail in the next section.

1.3.2. Human Capital for Solving Russia's Socioeconomic Development Problems: Different Approaches

Today, it no longer suffices to say that human beings and their skills and abilities play a decisive role in the development of society and the economy – a thesis that had already been recognized in Adam Smith's time [Sweetland, 1996].

This statement tells us nothing about the specific human traits that should be developed and the way that this should be done in order to improve life. Indeed, there are several possible answers to these questions.

1.3.2.1. Answer 1: Heeding the Demands of the Labor Market and Preparing Students Better for Specific Jobs

In keeping with the prevailing views, the recipes for transforming the education system in Russia (and other states, including Hun-

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gary [Times Higher Education, 2013],⁴ Turkey [Özoğlu, Gür, Gümüs, 2016], and even the most developed European countries [Flisi et al., 2017]) are being increasingly reduced to the demand to insert the study process as much as possible into real practical activity and to tie education planning and curricular design to the labor market in order to assure that graduates find work in the areas of their majors. This strategy is endorsed both at the very top of the Russian education system and by teachers and students. It is not surprising that such an understanding of the problem is central to many international discussions about the development of human capital. For example, the conclusion of *The Global Human Capital Report* by the World Economic Forum states that “Many of today’s education systems are already disconnected from the skills needed to function in today’s labor markets and the exponential rate of technological and economic change is further increasing the gap between education and labor markets” [WEF, 2017, p. 34].

The advantages of this approach are clear. Without a doubt, it is very important to provide the labor market with qualified workers who have the necessary competencies for successfully performing contemporary jobs (and the jobs that will appear in the future) — for example, preparing specialists with the specific “rigid” skills required by IT jobs [Setor, Joseph, 2016]. In particular, according to the estimates of the Center for Strategic Research, Russia will need about a million programmers in the near future [Kudrin, 2017].⁵ Preparing specialists for such strategic niches should become one of the priority tasks of the Russian education system.

⁴ Times Higher Education. 2013 // Hungary, Pay or Stay. <<https://www.insidehighered.com/news/2013/01/25/students-rally-against-hungarysplans-higher-education>> (accessed 28 December 2017).

⁵ “Formula for a New Economy: Creative Industries and Innovative Development” Calvert Forum Siberia. Cf. <<https://news.sputnik.ru/ekonomika/939d65f256bc1b17198347780b903342d0ea52f0>>; <<https://vz.ru/economy/2017/11/11/894734.html>>.

At the same time, this approach has several pitfalls. The most serious problem is probably the fact that it makes use of the existing institutes of the labor market and the economy, which are not very effective in Russia. One can surely create mechanisms for stimulating employment and career planning within the education system, which will help to assure the necessary quality and quantity of graduating specialists to fill the existing niches on the labor market. However, these mechanisms will not affect fundamental economic institutes; on the contrary, they will make human resources particularly well adapted to a technologically and structurally outdated economy. The insertion of contemporary on-the-job training into study programs will probably help students to meet the explicit demands of existing companies better. However, if Russia's economy is already systemically ineffective, it is highly unlikely that existing companies in their present state are able to bring about the needed growth. Thus, the new specialists will only consolidate existing routines rather than restructure ineffective companies.

The traditional approach that "it is better to prepare students for jobs" is also unable to solve the problem of the high instability of the demand for specialists in most sectors, which leads to very short time horizons of human resource planning in most companies. Studies have shown that the time horizon of human resource planning even in major Russian companies is less than four years (and, most often, only one year) [MEMO, 2014, pp. 7–8].

This instability is due not only to poor strategic planning in companies but also to objective rapid changes in technologies and thus to rapid changes in demand for worker competencies. The idea of highly specialized education for a lifelong career no longer corresponds to today's social and technological development rate. As the report *Deloitte Human Capital Global Trends 2017* notes, professional skills must be updated at least once every five years on average today, while the careers of people entering the workforce today are expected to last between 60 and 70 years [Deloitte, 2017, p. 30].

Nevertheless, the education system continues to behave as if it suffices to acquire professional skills and knowledge once without ever renewing them subsequently.

The limitations of this approach are particularly clear for businesses.

As far back as the early 1990s, publications on management noted the acute need to improve the understanding of how individuals and groups create innovations [Scott, Bruce, 1994]. The origins of this ignorance are clear enough: up until the 1990s, innovations were seen, first and foremost, as the result of a properly organized technological process (mostly consisting of routine actions) rather than as the creation of actions of a new type.

It is no surprise that contemporary literature focuses not only on how to make workers learn specific skills but also on how to stimulate these workers to create innovations [Sing, Choi, 2014].

We should repeat that the striving to meet the demands of the labor market is important and even necessary (especially for sustainably growing sectors of the economy), yet it does not solve the main problems arising in the conditions of the accelerated and often unforeseeable development of the knowledge economy. In such a situation, the positive impact of subject cognitive skills of school students on economic growth discovered by Hanushek and Woessmann [Hanushek, Woessmann, 2011] may turn out to be limited in the long run due to the fact that even a lot of fundamental knowledge is rapidly becoming outdated (for a further discussion of the possibly declining impact of cognitive skills on growth in the 21st century, see [Komatsu, Rappleye, 2017]). Detailed forecasts of returns on education (and especially on cognitive skills) up until 2090 assume that changes in macro parameters that have been observed over the past decades will remain stable. However, this is supported neither by the well-known “black swan theory” [Taleb, 2007] nor by the fact that macro-forecasts of the development of highly complex phenomena based on long-term past observations virtually never work [Hendry,

Mizon, 2014]. The risk society [Beck, 1992] is a society in which unpredictability is the norm.

1.3.2.2. Answer 2: Developing General Human Capital – Prioritizing the Inculcation of Key Competencies

While the classical theory of human capital focused on specific human capital (concrete skills needed for a limited range of jobs), one has increasingly assigned importance in recent decades to general human capital that is understood as key or universal skills.

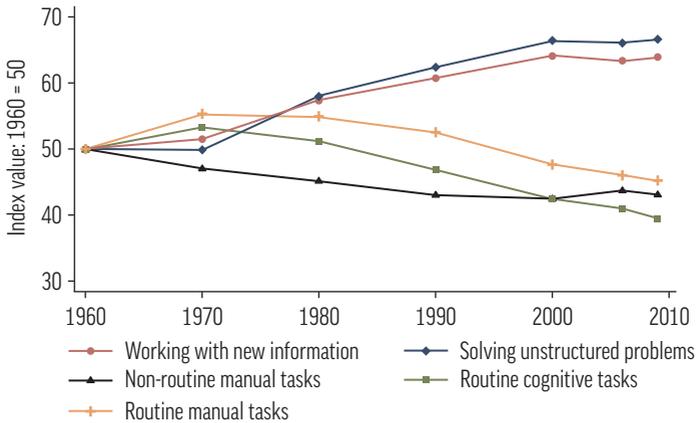
The priority given by the classical theory to specific over general human capital has been seriously questioned – in particular, with regard to business development [Garloff, Kuckulenz, 2006]. For example, a study of the history of European startups over a twelve-year period [Rauch, Rijsdijk, 2013] showed that specific capital “unexpectedly” had a negative impact on business development.

Rapid changes in technologies and labor conditions [Deloitte, 2017] call for workers who are not only qualified but also able to relearn. Other studies show that substantial changes have occurred in labor forms over the past decades; these changes boil down to the growing number of non-routine tasks and a considerable increase in labor activities requiring well-developed communication skills [Levy, Murnane, 2013]. Thus, there is a growing role of so-called key competencies (including communication, cooperation, analytic thinking, and creative activities) that make up the core of general human capital [Levy, Murnane, 2004].

The main trend on the global labor market is the increasing number of jobs requiring non-routine skills [Levy, Murnane, 2013], including the ability to improve one’s working environment and labor functions independently; these skills are becoming an essential element of “smart” economic growth (Fig. 6). As the experience of innovative economies (especially the USA) shows, these jobs lead to higher productivity and are much better protected from the risks of unemployment.

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Figure 6. Index of changing work tasks in the US economy, 1960-2009



Source: [Levy, Murnane, 2013].

“Soft skills” also determine the level of general human capital — in particular, work culture, self-organization, persistence, and managing one’s own career [Seibert et al., 2013]. Their importance for high-quality work is confirmed by the fact that employment agencies of all kinds tend to consider *all* work experience as a very positive characteristic of the applicant. Indeed, HSE studies show that there is a stable positive correlation between how early a person begins to work (combining work and study) and the salary he or she receives after graduation. Curiously, empirical studies show that there is virtually no impact of the “color” of the diploma on future salaries [Rudakov et al., 2017]. From the theoretical standpoint, any diploma, regardless of its color, signifies that its holder has acquired core competencies and knowledge. In this way, the success of a “C” student on the labor market after graduation does not refute the key thesis of the theory of human capital that the acquisition of knowledge and skills (in this case, as the foundations of general human capital) is an important factor of individual success.

In this approach, education can “allow” a student not only to get practical working experience (not necessarily in the area of his or her major) but also to acquire key (universal) competencies on which general human capital is based. From this standpoint, the key components of education are project work, social work, and the development of communication skills. A promising model for bachelor’s studies is the liberal arts system, which is marked by a comprehensive approach to man and by self-study with an emphasis on the development of general communication skills, critical thinking and emotional and social intelligence [Dirks, 2016; Mehrens, 2016].

Current attempts to implement this approach by simply introducing universal competencies into secondary vocational and tertiary education standards are clearly insufficient. This approach is further hindered by the terminological confusion that has arisen from the rapid introduction of different frameworks of key core skills and competencies for the 21st century. Thus, studies proposing a clear and simple framework are particularly valuable. For example, a recent report by an HSE international team sums up international discourses and proposes dividing universal competencies into three groups: cognitive problem-solving skills, the competency of interacting with other people, and the competency of self-organization and self-development [Froumin et al., 2018]. In this book, we will use the terms “key” or “universal” competencies and “21st century skills” to refer to these three groups of characteristics.

Together with the improvement of institutes bridging education and the labor market (from the education side), this approach will make a considerable contribution to solving the problem of raising productivity.

However, it, too, is unable to resolve the problem of the inefficient structure of the economy and its resistance to positive change.

1.3.2.3. Answer 3: Developing General Human Capital – Prioritizing the Inculcation of Individual Traits

Since the 1990s, the approach of Noble Prize winner James Heckman has been increasingly adopted in international publications on the economics of education. One of Heckman's key ideas is the importance of non-cognitive personality traits for success in study, work and life as a whole. According to Heckman and his colleagues, these traits include “perseverance (‘grit’), conscientiousness, self-control, trust, attentiveness, self-esteem and self-efficacy, resilience to adversity, openness to experience, empathy... which are valued in the labor market, in school, and in society at large” [Kautz, Heckman et al., 2014, p. 2].

To all intents and purposes, these include all the personality traits that

a) cannot be measured by traditional tools for assessing the quality of education; and

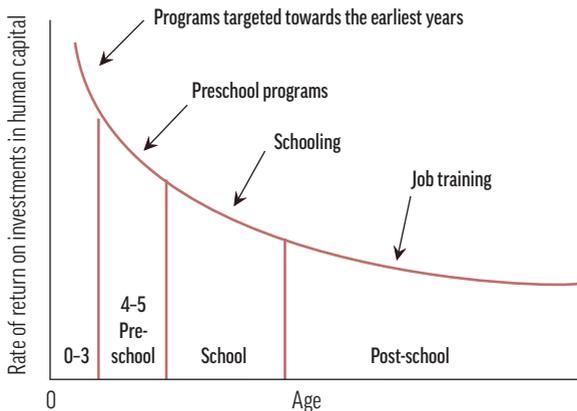
b) have traditionally been considered to be not so much “skills” (i.e., abilities that can be taught) as “traits” (i.e., certain constants that are not subject to profound change).

Heckman asserts (and substantiates by a broad survey of empirical studies [Heckman, Kautz, 2012]) that such traits as persistence and self-control can be developed and are not pre-determined.

Heckman's studies show the particular effectiveness of measures for developing non-cognitive skills among children at an early (pre-school) age. The “Heckman Curve” showing the diminishing returns on investments with age has become a “classic” of the economics of education [Heckman, 2008] (Fig. 7). Heckman demonstrates [Kautz, Heckman et al., 2014] that “diminishing returns” are more characteristic for the development of basic cognitive skills than non-cognitive abilities (which can be developed fairly effectively among adults, too).

Despite the broad recognition of Heckman's ideas, his studies show that practical experience in developing non-cognitive skills (as

Figure 7. Return per unit dollar invested at different ages



Source: [Heckman, 2008].

a key element of human capital) continues to be limited in the education policy of developed countries [Kautz, Heckman et al., 2014].

The insufficient attention given to this element of human capital in education literature is also reflected in the fact that the basic conceptual model used for examining non-cognitive traits is still the so-called “big five personality traits” [Vedel, 2016; Giluk, Postlethwaite, 2015]. The “big five model” was developed in the 1950s and 1960s, and it would be logical to assume that there are non-cognitive traits that were not included in the model back then yet that have become important today. One such “new” non-cognitive trait of 21st century human capital is so-called “grit” [Stokas, 2015] or perseverance in the face of adversity.

1.3.2.4. Answer 4: Developing General Human Capital – Prioritizing the Inculcation of Initiative, Enterprise, and Active Independence

By the year 2030, no profession will remain unchanged due to the rapid expansion of technologies. According to the World Economic Forum, the percent of production processes that can be automated

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will increase by 20–50% on average in all groups of sectors over the period 2018–2022 [The Future of Jobs Report, 2018, p. 11]. The rate of change will constantly increase, leading to the further growth of the already sizeable gaps in labor productivity between sectors and within (all) sectors. The countries that lose out in this “global race” will not necessarily be deprived of their prestige or possibilities of assuring a high standard of living for their citizens due to the negative demographic trends all over the world today. The world’s population is rapidly ageing. According to McKinsey [Manyika, 2017, p. 16], the growing size of the labor force accounted for about 50% of global economic growth in 1964–2014, yet this factor is totally exhausted today and is even beginning to have a negative impact. How can this challenge be met?

In the global competitive world of the 21st century, the structural characteristics of each society are determined not only by the efficiency of individual institutes that have been “ripened” and perfected through decades of persistent reform but also by **“new” institutional forms that come from without or emerge from within in response to unforeseeable external demands.**

A case in point is the “uberization” of the markets of ride and real estate services: all over the world, heretofore effective businesses in the taxi and rental housing sectors were suddenly faced with the radical challenge of a totally different organization of labor.

Another example is the effect of social networking services: the appearance of Facebook has transformed models of interaction between young people in virtually every society, no matter how effective informal communication forms had been up to then.

The authors are not asserting that all the spontaneously arising and extremely variable global institutional forms (as well as the no less flexible local responses to them by concrete societies) are always positive. **We do not know how long-lasting and constructive their impact will be. However, it would be impossible to deny the fundamental significance of this impact.**

Thus, one can conjecture that the winners in the global competition will be countries that strive to create an environment in which new flexible institutional forms responding to changing internal and external challenges will be generated more quickly and effectively than in competitor countries.

People will need broader types of competencies that can be applied to supporting as well as to transforming existing institutes and orders. If we use the terminology proposed by Neil Fligstein [Fligstein, 2001], one such competency would be “the ability of actors to induce cooperation in other actors... The skill required to induce cooperation is to imaginatively identify with the mental states of others in order to find collective meanings that motivate other actors.” This idea is close to Heckman’s thesis about the fundamental importance of non-cognitive skills and socio-psychological personality traits for success in modern economy and life. It essentially refers to skills that are more social in nature and that are connected not so much with the ability to perform a specific complex task independently (such as the tasks proposed by a traditional IQ test) as with the ability to grasp (“sense”) what problem should be solved, with whom one should interact, and how this interaction should be structured [Lundberg, 2017].

This also requires special motivation and value characteristics and a special sociocultural identity (i.e., set of attitudes) that serves as a basis for what J. Meyer calls “expanded actorhood” or a new form of “agency.” The “actorhood” becomes “expanded” insofar as it pushes the limits of institutional prescriptions without fully adopting a utilitarian (egoistic) logic. Tertiary education plays a key role in the development of this ability [Meyer, 2010].

To respond to the challenge of the disappearance of traditional jobs, the education system should prepare individuals who retain their value for the development of the economy yet become even more effective thanks to their abilities of adjusting to new demands of human-computer interaction and creating new jobs for the digital economy.

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A key aspect of this approach to analyzing the connection between the traits of individuals and the socioeconomic development of society is that it values both the ability to be effective and generate “returns” (at the individual and societal levels) in the framework of existing institutes and the ability to act in such a way as to change the existing rules of the game and the system of expectations.

We should emphasize that “active independence” (that we use as a general term encompassing “agency,”⁶ “transforming” social work, “expanded activity,” etc.) should not be understood as “destructive” or “revolutionary” behavior. The advantage of the proposed approach is that it promotes the development of society by activating the positive potential of its members and structures in order to create new opportunities for action by constructively transforming existing opportunities rather than destroying them. The term “agency” in this understanding (in contrast to alternative approaches to the interpretation of “agency” in education [Klees, 2016]) is marked by a logic that is creative rather than allocative.

The expanded “collective active independence” of individuals refers to the possibility of involving existing groups in new forms of activity not by rigidly changing the rules of the game (which is quite painful, as a rule) but thanks to a “soft” diffusion of new ideas, notions and even “identities.” The logic is simple enough: when people take a new look at themselves and the surrounding world, they begin to act in new ways.

1.3.2.5. Answer 5 (Integrating Answers 1, 2, 3 and 4): Comprehensive Understanding of Human Capital for Success in the 21st Century

To augment the contribution of education to the socioeconomic development of society and the success of individuals, the education system must change its approach: in addition to “molding” individuals to adapt them for the specific demands of the labor market, it

⁶ Our use of the term “agency” derives from sociology rather than economics (“agency problem”).

must promote creativity, initiative, and teamwork along with other “universal competencies” and “active independence.” Such graduates will not only find jobs in existing niches in society and the economy but also (if such niches are lacking) create new ones — new jobs, new companies (through innovative ventures) and new social structures.

Rethinking the role of human beings in the development of economy and society leads to a new understanding of human capital and the differentiation of “capital” and “potential” [Kuzminov, Froumin, 2018]. Today, it is no longer possible to go by an understanding of human capital in which the individual is understood as a “cog” that must be shaped in a high-quality way in accordance with rigid homogeneous standards and inserted into the right place in a big mechanism — the labor market. This would be all the more absurd in Russia, where the labor market does not meet the demands of innovative economic development and a number of other macro-economic institutional conditions [Gimpelson, 2016]. A broader understanding of human capital presupposes the need to develop four basic groups of qualities in human beings:

- special competencies (for specific jobs) — specific human capital (one can also include basic subject cognitive skills here);
- universal competencies which usually include communication and cooperation skills, creativity, critical thinking, stability and adaptability in the conditions of social changes and challenges, and the ability and readiness to relearn — part of general human capital;
- personality traits (attitudes), including the so-called “big five model” — extraversion, agreeableness (friendliness, ability to compromise), conscientiousness, neuroticism (opposite of emotional stability), openness to experience — and other personality traits whose impact on success has been discovered fairly recently (for example, “grit,” “resilience” [Stoffel, Cain, 2018], “self-regulation” [Miele, Scholer, 2016], etc.); and

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- active independence — the ability to build one’s own career and social trajectory in a responsible fashion and make the world a better place in constructive cooperation with other people.

The fourth element of human capital (in scholarly literature, it is denoted by such terms as “enterprise,” “initiative,” “subjectivity,” and “agency”) has made its way onto lists of desirable qualities for employers and recruiting agencies. It reflects the demand of the economy and society for individuals who can not only become effective participants in already existing structures but also capitalize their potential in the conditions of limited institutional possibilities (above all, in the conditions of a job shortage or poor labor market institutes). “Active independence” is particularly important in the current situation of job renewal. In the near future, all workers (and not just “professional” businessmen) will face the need of renewing the methods and tools (including new technologies) they use in their activities. According to a survey of the World Economic Forum [The Future of Jobs Report, 2018], the world’s businesses are not planning to retrain all their workers to meet new demands in the conditions of growing competition and falling international economic growth rates. Companies are planning to invest in retraining only their most productive workers. The remainder of the labor force is increasingly facing the prospects of working part-time and freelancing [ibid., p. 13]. New opportunities in these niches are emerging on the labor market. However, to take advantage of them, individuals must be able to organize their activities and networks of business relations themselves. This is why such “active independence” can become a key dimension of human capital in the global competition of the 21st century.

The new understanding of human capital — “**Human Capital 2.0**” — responds to the need to develop the personality traits with which people are able to change outdated routines and institutes, work in the conditions of new technologies and economic incentives, and promote the ethical principles of the common good.

Cardinal civilizational transformations will occur regardless of how Russian education changes (and even if it does not change at all). However, reforms in the education sphere that respond to external challenges to society as a whole can have a decisive impact on Russia's ability to adapt to the realities of the coming decades.

Nevertheless, it should be said that posing the question in such a way does not contradict general humanist values and the idea of the full-fledged self-realization of every individual as a key and self-sufficient goal. In contrast, the proposed model of using education to drive economic growth views the individual as a supreme value and targets the self-realization, motivation, independence and initiative of individuals. Such an understanding of growth overcomes the contradiction between the idea of education as an instrument of human development and the idea of education as a resource for growth (in which the end goal is to attain certain "external" indicators).

1.3.3. New Understanding of Education as the Main Response to the Challenges of the 21st Century

To answer the question of what should be done in education to improve the country's competitiveness in the face of the aforementioned challenges, we also need *to understand international trends and to analyze the present state* and development scenarios of Russian education.

The classical theorists of human capital T. Schulz and G. Becker considered education to be a key source of human capital in the contemporary world. They understood education predominantly as the system of formal education. They assumed that, after graduating from the last level of formal education (e.g., college or university), a person leaves the education system. According to these authors, an individual's human capital in later stages of life mostly depends on his or her employer and is accumulated through training for a concrete job as well as work experience.

1.3. What Kind of Human Capital Does Russia Need for Rapid and Sustainable Socioeconomic Development in the 21st Century?

At the same time, the realities of today's global and institutionally unstable world make it necessary to redefine education. First of all, one tends to speak today of the "education sphere" rather than the "education system." The education sphere refers to the totality of the relatively stable (though constantly changing) forms and practices through which the individual accumulates and develops knowledge, skills, competencies, attitudes and values.

This leads to two basic ("paradigmatic") shifts in the understanding of education that are adopted by the authors of the present book.

First of all, education is increasingly understood **not as a system of organizations but as a sphere of activities** that can involve both systematic "formal" study programs and short study projects that do not necessarily lead to certificates. Another important constituent is highly diverse types of experience that give a person new knowledge, attitudes or competencies (this can take place in all kinds of environments, including cultural and sports organizations, the family, recreation activities, social networking services, etc.). The phrase "**education ecosystem**" is being increasingly used in scholarly literature and political discourse (see, for example, [Chatterjee, 2018; Niemi, 2014]).

Studies by the Harvard Kennedy School and the Center for Global Development [Andrews, 2013] show that the reason why most institutional reforms are unsuccessful in developing countries lies not only in the disregard of the local context but also in the failure to draw upon the positive transformation potential of local communities. This problem is particularly relevant for the Russian education system. The human capital of Russian society does not exclusively consist of knowledge and skills accumulated through the formal education system (even if it is determined by the latter: without a good system of formal education, it is impossible to have high-quality human capital).

Responding to different incentives (labor market demands, global sociocultural trends, new forms and methods of interaction provided by contemporary technologies, etc.), Russian families,

businesses, and the civil sector have begun to find and create new means of generating and accumulating human capital. So long as these initiatives are confined to big cities and the digital environment, they cannot have a large-scale system impact. Cases in point are the rapidly developing innovative schools (Khoroshkola, Letovo, etc. [Mayakova, Ivanova, 2017]) and digital projects and initiatives in extracurricular activities for children and continuing education for adults (Kidzania, Skyeng, uchi.ru, Open Education, etc.) [Tsoy, Ivanova, Nagaytsev, 2017; Kosaretsky et al., 2018]).

Secondly, the focus of education debate is gradually shifting towards the **activities of students** rather than the work of teachers, professors and education administrators. The new priority is to launch self-study processes and support initiatives, interests and motivation. It is no surprise that the term “teaching” has been increasingly replaced by notion of “learning” in Anglo-Saxon scholarly and practical literature over the past 20 years [Barr, Tagg, 1995].

To solve the problem of creating human potential that is capable of having positive transformational impact on the economy and society, it is extremely important to “unpack” education. This refers to the radical expansion of opportunities for individuals to design their own education, career and life trajectories in accordance with their own tastes, preferences and interests and not only in response to the list of competencies sought by local employers.

To all intents and purposes, “unpacking” means that study trajectories cease to be confined to institutions and that education becomes a key and inalienable element of the life of every individual, being provided in a broad range of structural variations including both formal and informal formats as well as formats that are created by the learners themselves through expanded action.

Far from abolishing the need for the development of institutes, such an integrated approach gives it an expanded meaning. The education system must create not only mechanisms for connecting education to current and future labor markets (when universities will

1.4. The Russian Education System Has Already Cast the Foundation for Becoming Not Just a Resource but the Driving Force of Socioeconomic Growth

essentially have to assure the transparency of the labor market for their graduates and the mechanisms of their professional and even territorial mobility) but also open spaces for promoting and inculcating initiative and enterprise.

* * *

Such are the main traits of the challenge that education systems all over the world must meet and the different possible responses to this challenge and approaches to its solution seen through the prism of the conceptual framework of human capital. The quality of this response will do more than just determine the global competitiveness of a national education system. The successful transformation of education will cast the foundations for real improvements in the well-being and quality of life of society as a whole. This will benefit not just children and students, who will acquire first-rate human capital that will make them successful on the globalized labor market. It will also affect employees and retired people who will get the opportunity to become more effective in the 21st century economy, on the one hand, and benefit from the advantages enjoyed by a leader country in the international economic and technological competition (accessible high-quality healthcare, social security, and, last but not least, confidence in the future for oneself and one's family).

Is Russia ready to make a leap in socioeconomic development through education? Is its current education system advanced enough to assure its success? This is the subject of the next section.

1.4. The Russian Education System Has Already Cast the Foundation for Becoming Not Just a Resource but the Driving Force of Socioeconomic Growth

Today, Russia has greater education attainment than countries with comparable per capita incomes. This resource can play the same role as oil had over the past 15 years, and it is important to use it to drive

the growth of the standard of living of the country and its citizens in the second quarter of the 21st century.

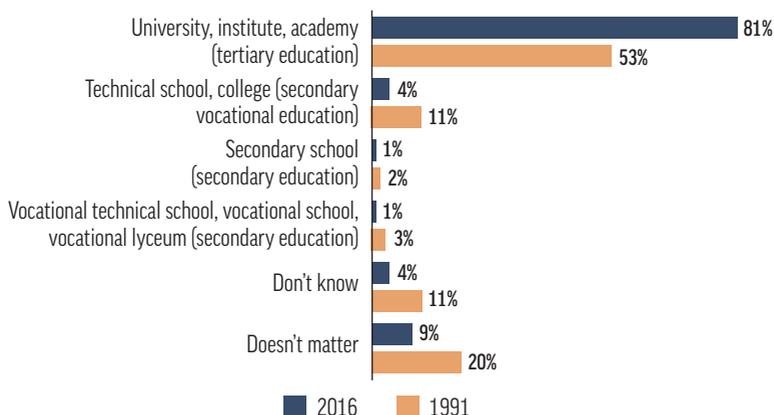
Russia has a strong education system that it inherited from the Soviet Union and then greatly improved in 2000–2018. Secondary education attainment is universal, while the quality of Russian schooling is fairly high and has kept growing in recent years. For example, leading international studies show that the reading and mathematics skills of Russian schoolchildren are among the highest in the world. Russia is among the world leaders in secondary vocational and tertiary education attainment. National projects, the initiative “Our New School,” the project for modernizing regional basic education systems, and the Presidential Directives of May 2012 have raised teacher prestige and salaries, reduced the extreme shortage of infrastructure (including IT), cast the foundations for an objective system of evaluating learning outcomes, increased the accessibility of preschool and extracurricular education, and promoted the development of research and entrepreneurial universities. These assertions may sound provocative or opportunistic in view of the constant criticism of the education sphere, public scandals and regrets about the lost “golden age.” The authors of the present book can also tell a lot about the major problems and shortcomings of our education system. However, “you can’t see the forest for the trees”: objective statistics clearly show that the mean indicators of the Russian education system considerably surpass similar indicators of competing countries.

The reason for both criticism and success may well lie in the fact that Russian citizens consider education to be a key social value and believe that high education attainment is one of the most important guarantees of success in life (Fig. 8).

Russia’s current education attainment and growing social demand for education give the country a number of advantages, including a high rate of user innovation and a high ratio of cultural consumption and hi-tech consumption to per capita income (Fig. 9).

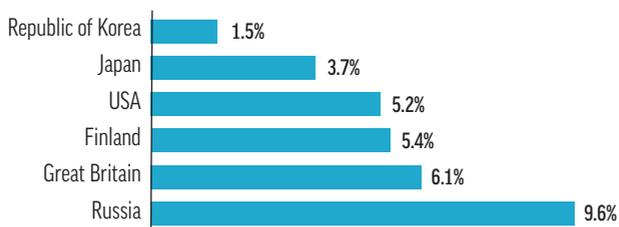
1.4. The Russian Education System Has Already Cast the Foundation for Becoming Not Just a Resource but the Driving Force of Socioeconomic Growth

Figure 8. Responses of the adult population to the question “Which education would you like to give your children and grandchildren?” (closed-ended question, one response, %), 2016



Source: Russian Public Opinion Research Center (VCIOM).

Figure 9. Involvement in user innovations, 2017 (percent of respondents).



Sources: HSE; Monitoring Survey of Innovative Behavior of the Population; European Commission Special Eurobarometer.

Over the past 19 years, the goals of **assuring the accessibility of education and improving its efficiency and quality that were set down in the “Conception of the Modernization of Russian Education” (2001) have been largely attained.** Following the trial and

adaption period of the 1990s, the period 2000–2018 may be called a time of the restoration of the education system and its gradual transition to a new stage of evolution.

First of all, the **accessibility of all levels of education has not only been preserved but also expanded**. The Russian Presidential Directive on the accessibility of preschool education for all children aged 3–7 is being implemented. The accessibility of extracurricular education, which continues to be higher in Russia than in other countries, is still growing: 67.7% of 5–18 year-olds were involved in it in 2016⁷ in comparison to 58.6% in 2013, and extracurricular education management systems have greatly developed in recent years [Mertsalova et al., 2018]. Participation in tertiary education among the relevant age groups amounted to 29.6% in 2016 in comparison to 15.0% in 1992. Russia ranks among the top three developed countries in participation in secondary vocational and tertiary education. Most Russians (83%) believe that it is important to get a tertiary education. **In the mean expected duration of study (assuming the start of the education trajectory at the age of 6), Russia ranks among the top 20% of countries with an indicator of 15.7 years.**

The increase in the accessibility of education has been accompanied by **improvements in the infrastructure of education organizations**: the percent of schools in need of capital renovation fell from 37% in 2001 to 12.4% in 2015, and the number of school students per computer fell from 70 in 2004 to 8 in 2014. Another major achievement was the reversal of negative trends in the **human resources** of education (ageing of the work force, falling quality of new personnel). Salary increases (in 2017, the mean wages of school teachers amounted to at least 100% of the regional average in 81 regions) have led to the rising social status of teachers and a greater admissions competition to tertiary teacher training programs.

⁷ <http://www.gks.ru/free_doc/new_site/population/obraz/Analit_spravka.pdf>.

1.4. The Russian Education System Has Already Cast the Foundation for Becoming Not Just a Resource but the Driving Force of Socioeconomic Growth

Despite all the difficulties and inconsistencies in solving the problem of human resources, competition has increased on the teacher services market, and the interest of high-school graduates in teacher training has grown.

Key institutional changes promoting the **culture of efficiency and fairness in education** have been the introduction of per capita financing and the objective evaluation of learning outcomes (the Basic State Exam and the Unified State Exam). Thanks to the Unified State Exam, admission criteria for state-funded tertiary education programs have become fairer for members of different social strata and inhabitants of different areas. The massive bureaucratic distortions and partial transformation of the idea of objective evaluation into the practice of total and excessive control in the education system notwithstanding, a culture of transparency and result-oriented behavior has gradually begun to emerge (especially at the local level).

Another major achievement of Russian education has been the adoption of Federal State Education Standards (FSES) for different levels of education over the past decade. One of their most important features is the orientation at learning outcomes. For the first time, the regulation of the content of education and the learning process has begun to focus on outcomes rather than on the process itself (i.e., what should be “covered”). Another important innovation is the appearance of “universal learning activities” and “universal competencies” among learning outcomes; these aspects determine an individual’s capacity for self-improvement through the assimilation of new social experience (this ability is becoming especially important in the conditions of the growing complexity of social systems in the 21st century). The progressive potential of contemporary FSES gives Russia a major competitive advantage over many countries and helps to cast the foundations for the breakthrough of Russian education onto a new level of quality. The introduction of the FSES has made it possible to transform the role and significance of the education system, which should become the main driving force

of the comprehensive institutional renewal of Russian economy and society as a whole. Despite the excessive generality of existing FSES and the archaic nature of study programs (which is shown by the fact that the Russian President has ordered school curricula to be brought in conformity with the country's priorities of scientific and technological development on several occasions since 2015), the transformation of the content of education is proceeding slowly but surely on the whole.

Another important and logical result of the various efforts undertaken in the 21st century, including the increase in financing, has been the growing **quality of education**. In 2016, graduates of Russian primary schools had the world's top scores on reading literacy. The PISA study also shows the sustainable growth of indicators of Russian schoolchildren. According to the TIMSS-2015 study, Russian 4th and 8th grade students ranked at least 7th in all subjects among participating countries and have demonstrated stable growth since the study was launched in 2003. Russian students also regularly get high scores on international competitions in chemistry, physics, mathematics and programming. Russian universities have entered international rankings and steadily improving their ratings: 24 universities were on the THE ranking in 2016 (in comparison to only two in 2012), 28 universities were among the leaders in QS rankings in different subjects in 2017 (in comparison to only two in 2014), and the number of Russian universities with top ratings has remained high ever since.

A new education quality assessment system is currently being developed in Russia. Particular attention has been accorded to the assessment of school education in recent years. Today, the education quality assessment system consists of different levels and procedures. The most important are the Unified State Exam in the 11th grade and the Basic State Exam in the 9th grade.

We should also note that major **structural innovations** have been launched at different levels of education over the past 15 years.

1.4. The Russian Education System Has Already Cast the Foundation for Becoming Not Just a Resource but the Driving Force of Socioeconomic Growth

Pilot projects have been implemented for building kindergartens with developmental object environments meeting contemporary standards and for developing the infrastructure of extracurricular education. The network structure of schools has been updated, allowing most children to study in fairly large schools with diverse educational resources. New types of organizations offering extracurricular technology education (“Quantoriums”) have been created. The Sirius network of education centers represents a major innovation in working with talented and motivated children, and its intensive short-term programs are attended by thousands of schoolchildren.

The network of secondary vocational education organizations has been transferred from the federal to the regional level, leading to an improved organizational structure, closer ties with businesses, the organization of continuing education courses for adults, and experiments in assessing the quality of education with the help of national vocational and international WorldSkills standards. Despite the insufficient orientation at the labor market and the weakness of system strategy at this level of education, there have appeared centers of excellence that can serve as examples of best practices for the rest of the system.

Significant structural innovations have been implemented in tertiary education. A group of new research universities has successfully entered global knowledge markets. Different support mechanisms have been tested in these universities, and many of them have proved to be effective. At the same time, mechanisms for doing away with low-quality tertiary education and creating a Russian online education platform have been launched. Many universities, including top organizations, are already successfully using online courses in their study programs as well as actively developing their own education products and placing them on national and international online platforms. Despite the very slow modernization and insufficient resources of most universities, rapid development is not only feasible but is becoming increasingly accessible.

Other competitive advantages of Russian education that are often noted by both Russian and foreign experts include its fundamental nature and the unified broad network of education organizations of different types and kinds that function harmoniously despite the high geographic, climatic, demographic, national and economic diversity of regions.

These achievements are the results not only of growing financing but also of effective state policy that was formulated in the priority national project “Education,” the national initiative “Our New School,” the Presidential Directives of May 2012, the project for modernizing regional education systems, the 5–100 Program for raising the international competitiveness of Russian universities, and a number of other national development projects. Thus, the key 21st century achievements are the public consensus on the importance of education, on the one hand, and the improvement of the infrastructure of education, the performance of students, and other objective education indicators (in comparison to competing countries), on the other. The national projects initiated after the Presidential Directive of May 7, 2018, cast the foundations and give a powerful impetus for a new stage of development of Russian education. An in-depth analysis of this subject is found in Chapter 3 of the present book.

In addition to the **systemic achievements** of the past 19 years, **extensive experience of innovative projects and experiments** has accumulated at virtually level of education, casting the foundations for the further effective transformation of the system in response to new challenges. Despite the declining support of innovations and experiments in recent years on account of spending cuts and the strengthening of conservative trends in education policy, the spirit of experimentation still exists in many regions, cities and major education organizations.

Thus, one can say with certainty that the education system has accumulated the potential for taking the next step in its development.

1.5. Concrete Socioeconomic Development Goals from the Standpoint of the Contribution of the Education System

In view of the national development targets of the Russian Federation until 2024 set down in the Russian Presidential Directive of May 7, 2018, and the challenges identified by CSR experts in 2018, education can contribute to attaining the following goals:

1) qualitative and quantitative development of human capital for assuring economic growth, the sustainable increase of wages, and the creation of a highly productive export-oriented sector in the basic sectors of the economy;

2) acceleration of the technological development of the Russian Federation, including an increase in the number of organizations involved in technological innovations and the accelerated introduction of digital technologies in the economic and social spheres;

3) enhancing social stability, including halving the poverty rate; and

4) augmenting the country's global influence.

The potential of education of contributing to each of these goals is described in detail below.

1.5.1. Quality and Quantity of Human Capital for Economic Growth

A) In the conditions of a shrinking labor force (up to 9% by 2025), every person is important, and so the need to **fight academic failure** has become particularly acute. In 2015, 28% of Russian 15-year-old school students were unable to apply their knowledge in practice in a satisfactory way (below Level 2 on the PISA scale) in at least one of three areas (science, mathematics, and communication in their native language). This indicator is a lot better in most OECD countries. Studies show that young people who were not successful in school are highly unlikely to overcome this lag at higher levels of education

and are **subsequently unsuccessful on the labor market, where they cannot work with sufficient productivity**. The OECD speaks of a high correlation between educational failure and economic underachievement stemming from a shortage of useful skills [Cree, Kay, Steward, 2012; OECD, 2016]. Decreasing school academic failure by a factor of 2 (to 14%) would lead to a growth of the country's GDP by 2% over a 10-year period, 5–6% over a 20-year period, and over 10% over a 30-year period.

A **high rate of academic failure among school students** can lead to the accelerated formation of deprived and socially excluded groups. School graduates who lack the necessary skills for life in contemporary society⁸ have low chances of success in their educational and labor careers. The system has an acute need of “second chance” mechanisms that would encourage unsuccessful school and university students to get a minimum level of education required for successful individual careers despite prior failures.

B) **Talents** play a major role in the human capital of any country and especially in intellectual capital. Today, economic success depends on generating and assimilating innovations, and so **nurturing and retaining talents has become a top national priority**. Despite the impressive achievements of our best high-school students on international competitions, our country lags behind competing countries in talent development: according to the aforementioned PISA study, only 1.7% of school students attain the highest level in all three areas (in comparison to 4.5–6.5% in leading countries). Russia ranked only 56th in the Global Talent Competitiveness Index in 2017. We also lag behind competing countries in the scope of talent support programs. There is virtually no infrastructure for identifying and supporting talents in the spheres of technology development and use, social work and entrepreneur-

⁸ A skill is the means of performing an action that has become automatic through long-term repetition and that can be done easily and quickly with minimal control by the consciousness.

ship, communication and design, and fields of study that are not on the school curriculum.

C) The growth of labor productivity depends a lot on **universal skills, positive social attitudes** and **self-organization**. However, employers complain precisely about the lack of these characteristics [Cree, Kay, Steward, 2012]. In Russia, less than 40% of school graduates, 20% of college graduates and 50% of university graduates take part in project work during their studies (not counting thesis work). Such **universal competencies as communication, cooperation, critical and creative thinking, the striving for self-development and training, and self-regulation skills (often called “21st century skills”)** are becoming particularly scarce on the labor market [Froumin et al., 2018; Dobryakova et al., 2018]. The shortage of these qualities among university graduates is noted not only by Russian companies but also by over half of employers in developed countries, as shown by surveys published by the World Economic Forum.⁹ In most OECD countries, school, college and university curricula were changed to respond to this shortage; today, project work makes up at least 30% of these curricula, and a lot of importance is assigned to social and emotional skills, self-regulation skills, the ability to learn, and financial and legal literacy, which is closely connected to computer literacy. Although “meta-subject competencies” have appeared in education standards, most Russian education organizations continue to focus on “hard knowledge,” assuming that students will learn 21st century skills on their own. At the same time, one should keep in mind that illiteracy leads to social exclusion, marginalization and growth of inequality.

The education sphere can also teach **active independence** that includes enterprise, social responsibility, and initiative. As we showed above, this aspect of human capital is vital for a country’s success today.

⁹ <http://www3.weforum.org/docs/WEF_Future_of_Jobs_2018.pdf>.

Another key demand of the contemporary labor market is acquiring a **new set of basic skills and knowledge that is necessary for taking advantage of the possibilities of contemporary civilization (in the digital, legal and financial domains)**. This set is often called the “new literacy” in scholarly literature. However, employers also note that these new skills and knowledge are not acquired by the young generation in the education system. Financial, legal and digital literacy is not among the learning outcomes tested by the education system.

D) **A third of secondary vocational and tertiary education does not correspond to the demands of the labor market (in some sectors, this figure is as high as two thirds)**. After completing their studies, 31.3% of university graduates and 40.5% of graduates of vocational colleges find work in areas outside of their major. In this situation, an important problem of secondary vocational and tertiary education is the disparity between the makeup of study fields and majors, on the one hand, and the demands of the contemporary labor market and the forecasts for the structure of employment in 2024 and even more in 2030, on the other. For example, most vacancies in STEM disciplines (science, technology, engineering and mathematics) in the USA relate to the digital economy (Bureau of Labor Statistics¹⁰), while the “digital component” is virtually lacking in the makeup of Russian secondary vocational and tertiary study programs. The excessive number of state-funded places in traditional engineering disciplines and fee-based places in economics, management and law does not help to provide the economy with qualified specialists in a broad range of applied fields. This disparity also stems from the excessive fragmentation of study fields in secondary vocational and tertiary education (higher by a factor of 7–9 than in competing countries).

¹⁰ <<https://www.bls.gov/spotlight/2017/science-technologyengineering-and-mathematics-stem-occupations-past-present-and-future/pdf/science-technology-engineering-and-mathematics-stem-occupationspast-present-and-future.pdf>>.

E) VET (secondary vocational education and worker training programs) meets with insufficient market demand and gives an unacceptably low “salary bonus”¹¹ of only about 10–14%. At the same time, a high percentage of jobs is filled by labor migrants who lack the necessary qualifications and the incentives for raising them. In these conditions, one can hardly expect a major growth in labor productivity. It is no coincidence that several large-scale studies have been launched in recent years to identify the disparities between the education system and employer demands for narrow professional skills and broad competencies. They include a study conducted by the All-Russia Public Organization “Business Russia” in 2004 and the joint report by the World Bank and HSE *Developing Skills for Innovative Growth in the Russian Federation* published in 2013 [Dudyrev et al., 2018].

F) The lack of working mechanisms for objectively assessing tertiary education results contributes to the poor level of preparation of many graduates. Today, accreditation is the main procedure for guaranteeing the quality of tertiary education. However, the accreditation process mostly involves the verification of documents to check whether a study program meets the Federal State Education Standards. As to the learning process itself and the students’ study and research results, they are assessed on a commercial basis by private testing and certification centers in the domain of tertiary education (Scientific Research Institute for Monitoring the Quality of Education, Ast Centre, VEP, etc.).

G) A nation’s productive human capital and especially its intellectual capital can increase through **migration** and the **attraction of talented foreign students** — especially to master’s and graduate programs. In Russia, the development of graduate programs is hindered by the fact that a considerable percent of graduate students, even at leading universities, have “pragmatic” reasons for enrolling

¹¹ The “salary bonus” is equal to the ratio of the mean salary of a specific category of workers to the average salary of workers with only a secondary education (11 grades).

in these programs (such as deferring their military service) [Bekova et al., 2017]. Moreover, many graduate students are involved in research and other paid work that has no connection to the subjects of their dissertations [ibid.]. Foreign graduate students pose other problems. In OECD countries, 27% of graduate students come from foreign countries, and these talents take part in research and innovation. In contrast, only about 5% of master's and graduate students at Russian universities are foreign citizens today, and most of them are not eager to participate in projects aimed at the development of the Russian innovative economy.

Universities are struggling not only to attract talented students from abroad but also to retain and develop their own talents. Between 2001 and 2015, the number of Russian citizens studying abroad almost doubled from 28,600 to 54,900. Although the number of students returning to Russia is growing, relatively few of them seek work in hi-tech sectors, science or education. Academic positions in Russia continue to be less attractive than in competing countries from the standpoint of both wages and the conditions of doing research.

H) Today's rapidly changing economy calls for the **continuous renewal of the knowledge and skills of citizens**. In Russia, the participation of the adult population in continuing education programs is among the lowest in developed countries: less than 20% in comparison to 40% in EU countries on average and 66% in Sweden.¹² Russian Presidential Directive #599 on increasing the share of adults participating in education programs (May 2012) has not been implemented in practice so far.

1.5.2. Boosting Technological Development

A) The foundation of innovative development — research and development — is vastly underfinanced: Russia spends 1.13% of its GDP on research and development in comparison with a world average of

¹² <https://stats.oecd.org/Index.aspx?DataSetCode=EAG_AL>.

2.23%. The 2012 presidential directives on this subject have not been implemented. As a result, Russia participates today in less than 5% of the most actively developing research areas on the global market of research and innovation (this indicator is equal to 20% in France and over 50% in the USA).

In the 21st century, the main driving forces of scientific and technological development are **research universities**. Today, tens of billions of dollars are spent on initiatives similar to the 5–100 Program that are implemented by at least 21 countries. As a result, the universities of these countries are getting top ratings in subject rankings and global research frontiers and assuring their countries' leadership in the global innovation race. In a number of subject fields, Russian universities do not make it even into the top 200 of international rankings. This means that, in these areas, Russia is at the periphery of the creation and diffusion of new knowledge and technologies. International university rankings are important not so much as indicators of a country's global prestige or even of the direct export potential of its education system (albeit both of these factors are undoubtedly important for economic growth) as an objective indicator of a country's ability to compete on global markets and, in particular, hi-tech markets.

Modern universities in developed countries create innovative business ecosystems that attract national and international investments. The annual revenues of companies founded by alumni of MIT and Stanford University exceed the GDPs of most countries. The growth rate of the number of hi-tech startups and their productivity in the university ecosystems of competing countries is significantly higher than the corresponding indicators in Russia, which also poses a threat to the country's technological competitiveness. At the same time, the rapid growth of Russian universities in international rankings in certain subject areas show that Russia has considerable potential to become a world leader in science and economic development, even if this requires major efforts.

B) According to employers, the **quality of specialist training for high-tech sectors does not meet the demands of the labor market**. To solve this problem, South Korea, Singapore, Finland, and the USA are promoting hi-tech research and project activities for school and university students. The subjects that are designed to inculcate such contemporary skills (e.g., the subject field “Technology” in school) have not been renewed in Russia for decades and are unpopular among school students as a result. The situation is similar in most universities, which (along with other factors) leads to low admissions competition to natural science faculties and low competition for jobs in hi-tech sectors. The competencies taught in secondary vocational and tertiary education mostly lag behind the development of new technologies. The problem of the continuous renewal of knowledge and skills has not been solved so far among adults. There also exist major inner problems relating to outdated infrastructure and ageing and insufficiently motivated university faculty.

In such conditions, the research productivity of Russian universities remains low. While a group of top Russian universities is making rapid progress in their subject rankings, 75% of global university subject rankings do not have any Russian universities at all in the top 100. This has led, in particular, to Russia’s considerable lag in the number of registered patents (40,000 in 2017 in comparison to 1,300,000 in China).

Most Russian universities focus on teaching (“teaching universities”) while few of their faculty members engage in research and project work. As a result, the overwhelming majority of universities are playing an insignificant role in the innovative development of regions and sectors today [Leshukov et al., 2017]. Most universities lack the financial resources for research. In Russia, the financing of research and development per university student amounts to only \$913 (PPP), which is 2 times lower than in Poland, 3 times lower than in the USA (taking community colleges into account), and 8 times

lower than in Germany.¹³ The innovation infrastructure that has been set up in Russian regions is used by only a small percentage of university students and faculty and by virtually no external organizations.

There is no effective system for preparing new generations of highly qualified specialists for hi-tech research and development, as most graduate students work on the side to support themselves instead of focusing on research work (about 70% of graduate students speak of the difficulties connected with the need to combine work and studies [Bekova et al., 2017]). This turns graduate study into a profanation.

C) There is **no mass system for teaching hi-tech competencies** in Russia. It is impossible to modernize industry if people are not taught the skills of using high technologies in education organizations and at the workplace. Courses teaching modern technology skills are unpopular among school students. Russia is the world leader in the percent of state-funded university places in engineering fields. However, the situation with regard to the quality of engineering education is much more complicated and mostly unfavorable. In most cases, such scholarships are awarded to insufficiently prepared high-school graduates, a fourth of whom have an average USE score of 56 (out of 100) or less (i.e., they got a C in science and mathematics in school [Monitoring Enrollment in Russian Universities, 2018]).

One of the key problems of technological modernization is the content of school education, which lags behind global scientific and technological challenges. Three (!) presidential directives on updating the content of school education have not been executed. The contemporary school system, despite its traditionally high results in certain subject fields, does not give graduates many basic competencies that are necessary for success in the 21st century. In particular:

¹³ According to OECD Statistics [OECD, 2018].

- Technological skills are taught very selectively and on outdated equipment, making it difficult for students to function in the new high-tech reality.
- Mathematics and natural science courses are not adapted to the needs of today's economy and civilization.
- Foreign languages are not taught sufficiently well, making it necessary for students to continue their studies at extracurricular or continuing education organizations, which hinders the assimilation of foreign technologies and the enhancement of Russia's global role.
- Courses developing creativity in the arts are not offered after the seventh grade, although creativity and the capacity for taking non-routine actions are increasingly required by employers.

1.5.3. Augmenting Social Stability and Fighting Poverty

The weak social elevators in the Russian education system along with the growing income inequality and the risk of marginalization of a significant part of the population can pose a threat to social stability and hinder the inflow of talented and active individuals into the cultural sphere and the economy. The expected future income and social status of a child is determined by the income of his or her parents to a greater extent in Russia than in many developed countries (over 30% in Russia in comparison to less than 20% in Norway and Finland [Jerrim, Macmillan, 2015]). This situation is aggravated by the fact that schools with different social makeups of students are becoming increasingly differentiated in the quality of personnel and amount of funding.

A) The Unified State Examination was introduced in order to overcome social inequality and raise the level of educational mobility. However, despite its enormous contribution to the accessibility of high-quality tertiary education for young people from Russian regions (their share among first-year students in Moscow universities has more than doubled since the USE was introduced), the chances

of a student being admitted to an elite university continues to be mostly determined by the socioeconomic status of his or her family, according to the “Monitoring of Education Markets and Organizations” and the “Enrollment Ranking” [Prakhov, 2016; Roshchin, Rudakov, 2016].

The achievements in making education more accessible have not fully solved the problem of equal educational opportunity. Moreover, despite the growing quality of school education, the number of children and young people with low independence and initiative and insufficient functional skills for the modern economy remains high (up to 75%). Today, such indicators are characteristic of developing countries with a surplus of workers and are unacceptable for Russia. It is noteworthy that children that get a low-quality education in schools mostly come from families with low social and cultural opportunities.

B) To all intents and purposes, the Russian education system is unable to respond to the challenges of growing **social differentiation**. The cultural and income disparity of children’s families is not overcome in the education sphere. In particular, international studies show that the gap in the practical literacy and academic achievement of schoolchildren from different types of localities (the bigger the locality, the higher the literacy) and from families with different education attainments has not declined since 2003 [Khavenson et al., 2018]. On account of the growth of fee-based extracurricular education, this sector has also begun to promote inequality and differentiation rather than reducing it. So far, this has not been viewed as unfair by the population at large, yet the situation may change on account of the deteriorating economic situation and the growing focus on the quality of education.

Generally speaking, the goal of greatly improving the effectiveness of the social elevators of education can be attained, as shown by the successful experience of “positive discrimination” mechanisms in the Soviet Union; the comparatively low dissatisfaction in Russian

society so far (in comparison to many developed countries) about insufficient social mobility; and the successful experience of implementing institutional mechanisms such as the USE.

Social mobility and equal opportunities are the foundations of sustainable development in any society. Today, the Russian education system, far from promoting social mobility, tends to **consolidate the existing social inequality**. One of the causes is the growth of the pay service sector that is not being compensated by target support for low-income families.

C) Societal development depends not only on the inculcation of skills that are in demand on the labor market but also on social involvement, active patriotism, and the striving to promote the common weal. However, studies show that only a small percent of school, college and university alumni have gained experience in leadership, active and constructive social work, and team projects. Social involvement should begin in school. However, the widespread practice of forcing schoolchildren to take part in mock social activities leads to an aversion for social work and discourages initiative. It is no surprise that the percentage of children that take an interest in school halves between the fifth and ninth grades.

1.5.4. Enhancing Russia's Global Status

Another characteristic of the 21st century is the rapidly accelerating **globalization of education** and the resulting acute competition for talents and for promoting one's values and worldviews. The influx of foreign students and teachers leads to the creation of jobs and, as a result, raises the country's revenues. It is no surprise that global education products, mass online courses, international comparative studies of education quality and university rankings have become popular in recent years. We are seeing the emergence of an international hierarchy of education superpowers that attract talents and diffuse intellectual and cultural models. The countries that remain at the bottom of this hierarchy will inevitably face the

emigration of its most promising students and scholars as well as the devaluation of national education brands, the weakening of national values and cultural identity and the loss of “soft power” potential.

Thus, it is important for Russia to expand and make effective use of its considerable accumulated potential for radically improving its position on the global education market. The existence of this potential is shown by two facts: the existence of world-class universities capable of attracting clients of education services from the global market, on the one hand, and the considerable number of foreign students studying in Russia, on the other.

A) Russia is facing unique opportunities and risks from the **unprecedented growth of the popularity of mass open online courses (MOOCs)**. In 2016, three years after the creation of global online platforms, the number of students taking such courses attained 58 million people or one-third of the international student body. In all likelihood, the number of people taking MOOCs in 2020 will be equal to the total number of students in traditional tertiary programs (200 million individuals).

Russia was late entering the market of global education products (in particular, mass open online courses). However, the concentrated efforts of Russian universities in 2013–2015 led them to obtain 2% of the world audience of MOOCs. Still, as these initiatives did not get sufficient support, the rate of growth of the Russian segment of this market lags behind the world average by 20%.

B) The world’s top three exporters of education — the USA, Australia and Great Britain — attract 36% of all international students. While Russia ranks fifth in the number of foreign students, the quality of this student body (and the revenues from it) is much lower than in competing countries. **Russia does not rank among the countries with the most attractive education systems that attract the talented young people that will make up the world’s elite 15–20 years from now.**

1.6. Main Obstacles to Modernizing the Education System for Responding to Russia's Socioeconomic Development Challenges

What are the main systemic reasons hindering the positive transformation of Russian education despite the achievements described in Section 1.4?

The organization of the education process is insufficiently oriented at promoting independence, creativity and the development of student interests. Project work and self-study are weakly developed (especially in lower secondary education in grades 5–9), and the content of education often has no connection to the life experience of students already from the first grade.

The organizational formats are insufficiently flexible. The global trend of “unpacking” study programs (transforming long study programs into short programs) and awarding “micro degrees” (certificates in specific competencies that are credited in study programs at different levels and in different fields) is being weakly implemented, and there are significant barriers to network interaction and impenetrable borders between levels of education and between narrow fields of study.

Teachers and administrators are incapable of solving new problems and have low innovative potential. Despite reduced risks of personnel deterioration (mainly thanks to the May Directives of 2012), a substantial share of education workers does not show initiative or update their competencies.

Russia lags in the digital transformation of education. The education system “in itself” does not create a demand for new education instruments and new digital technologies, especially as substitutes for traditional instruments. Digital technologies in education make it possible to attain new qualitative results with lower expenditures. However, their introduction requires making investments in human resources and boldly modernizing existing forms of education.

While ***education goals can be attained only with the participation of society at large***, opportunities for joint activities between education, culture and sport organizations and human capital development companies are very limited.

Education follows a logic of “improvement” mostly under the impact of inner stimuli rather than in response to the needs of economic and social development that largely arise under the pressure of global competition. Certain key transformations (e.g., the digitalization of education, the development of ties between the education system and employers) that have already demonstrated their effectiveness have not received sufficient financial support for their introduction on a large scale, which lowers their system impact. The problems of developing the innovative and creative potential of new generations and inducing positive social transformation through education remain unsolved.

Feedback mechanisms are weak, and insufficient measures are taken to involve external actors (employers, parents and local communities) in the education system. To all intents and purposes, *external stakeholders are not driving the development of education.*

In particular, **employers** have had little impact on the education system up until recently. The low level of competition allows market leaders of sectors to attract experienced workers from other market players. Whole sectors of the economy such as construction, public utilities and residential services, logistics and commerce largely make use of migrant labor. At the same time, employers are seeking to reduce hiring risks by developing reliable indicators of the professional qualifications of workers, especially through an independent assessment system, whose introduction was launched by Federal Law #238-FZ of July 3, 2016. This will augment mutual trust on the labor market and the transparency of relations between employers and employees (today, the main criterion by which an employer judges a prospective employee is his or her prior salary). However, the transition to a modern and effective retraining system that would meet the

targets of economic growth requires the participation of the state as a guarantor of the quality of educational products, on the one hand, and the reliability of new assessment procedures, on the other.

One should greatly increase incentives for employers participating in the organization of practical study, for transferring corporate training to colleges and universities, and for joint R&D work between companies and universities.

Governmental organizations (departments and ministries except for the Russian Ministry of Education and Science) and regional and municipal government do not have sufficient powers and resources to develop the education system today. As a rule, they only maintain its basic operation. Nevertheless, recent experience shows that, when the federal government sends the right signals, some regional and municipal authorities get involved in the process and become driving forces of education. Another hindrance is the insufficiently effective separation of powers between municipal and regional government. As the experience of Moscow and some other cities shows, municipal government can create contemporary education ecosystems with a unique combination of local educational, cultural and social resources. At the same time, municipal authorities have limited impact on rural areas. One needs to take a differentiated approach to involving sectoral, regional and municipal administrators in the attainment of education goals.

For **parents**, giving children a good education is a top family priority. 58% of the population considers education to be the main condition of success in life. Families are ready to invest in high-quality education: recent surveys show that over 40% of the population is willing to do so. In practice, private monetary and non-monetary investments in education are hindered by low awareness. In such a situation, there is a growing trend of shifting to homeschooling and creating a “shadow” education sector. In this context, parents play a particularly important role in education by investing not only money but also time — their own and

their children's. However, the continuing existence of paternalistic expectations that "school will do everything on its own" leads to the low participation of parents in their children's education and even personal development. Making parents more active is a key goal in the development of education.

Students differ greatly in their willingness to invest time and effort in education. Yet these investments play a key role in the system's effectiveness. The main risk group is children and teenagers from families with low education attainment and low incomes as well as students that are unable to cope with the basic school program; these two groups coincide, as a rule. Their percent among schoolchildren increases between the first and ninth grades on account of falling motivation and weak support. At all levels of education, the presence of students that cannot cope with the curriculum on account of low motivation and poor preparation leads to a considerable decline in the motivation and quality of learning of other students and in the motivation and quality of work of teachers; it can even serve as a factor promoting corruption. The main condition for increasing the effectiveness of education is to raise the sense of responsibility of students and encourage them to play an active role in choosing and acquiring competencies, skills and knowledge instead of simply serving as passive "receivers of information."

Insufficient investments in education by the government and weakly developed mechanisms for attracting private investments. Despite a growth in education spending by over 2.5 times in 10 years, Russia ranks as low as 100th in the world in the percent of the total spending on education at all levels of government in the GDP (3.5% in 2016 in comparison to 4.1% in 2013). In recent years, spending has begun to fall in absolute terms, too. Underfinancing together with rigid formal standards have made the system focus on the reproduction of existing methods and standards. Underfinancing is the key obstacle to overcome if we want Russian education (and Russian society as a whole) to become a qualitative leader in the global

competition. We will discuss the problem of underfinancing in greater detail in the next section.

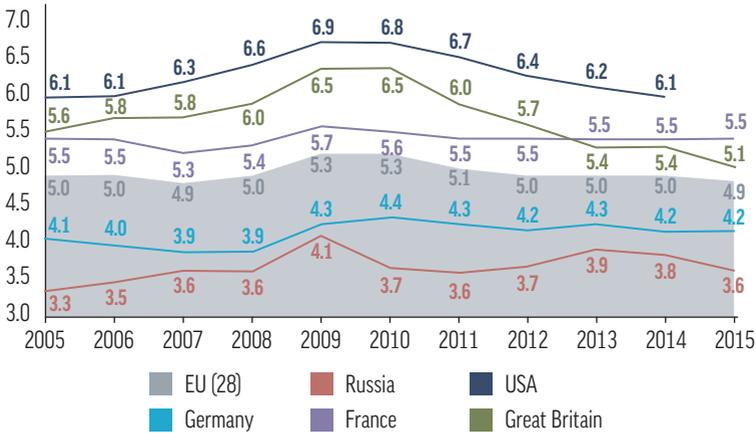
1.7. Underfinancing as the Chief Problem of Russian Education

Without a doubt, the main reason for the poor capitalization of human potential is the education system's failure to keep up with the changing demands of the economy — especially with regard to quality, which, in turn, is linked to the vast **underfinancing of education in comparison to officially declared levels**.

Russia has a duration of compulsory education similar to developed countries and is the world leader in upper secondary and tertiary education attainment yet spends one-and-a-half times less “public” resources on education than the majority of such countries (3.5–3.7% vs. 5.2% of the GDP, see Fig. 10). It furthermore has a fairly low level of private investments into education: only 0.8% of the GDP. According to OECD comparative studies, the financing of education at purchasing power parity from all sources per college or university student in Russia in 2015 was 1.7 times lower on average than the OECD mean value and 2 times lower for school students. R&D spending per student at Russian universities is 8 times lower than the OECD average.

The education system can function in the conditions of underfinancing yet only in an inertial state. Any attempt to take it out of this state creates a misbalance, aggravating the effects of underfinancing. The system's current resource problems emerged in the 2000s yet were further aggravated in 2012–2018 by the Presidential Directives of 2012 on raising teacher salaries at schools and universities, on the one hand, and the falling financing (in real terms) of education on the whole, on the other. As these processes took place during the four-year cycle of falling real incomes in 2014–2017, the insufficient public financing of education

Figure 10. Public spending at different levels of education in 2000–2015 (percent of the GDP)



Source: The World Bank.

was poorly compensated by private investments (in contrast to what had taken place in the 1990s and during the seven prosperous years of the 2000s).

This has had the following principal consequences:

- The human resources of school education have improved.
- The material infrastructure of education (apart from preschool education) and the curricular and technological support of the study process did not get the necessary investments and began to fall behind in their development.
- The underfinancing of education shall continue to grow due to demographic trends. By 2024, the number of children and young people aged 3–21 will increase by 12%.

The primary cause of underfinancing is the growing cost of meeting contemporary standards at all education levels, including the levels which the state guarantees to be free and universal. Moreover, underfinancing has a tendency to accumulate.

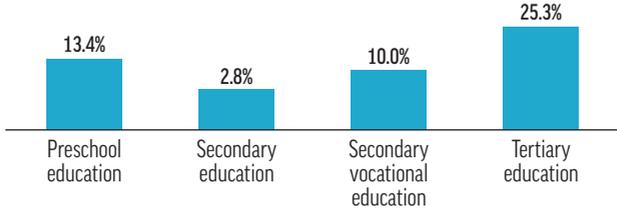
The Russian Constitution (Article 43) declares that all types of formal school education and secondary vocational education must be universally accessible and free of charge. The degree of accessibility of free tertiary education as set down by law is higher in Russia than in countries with similar or even higher per capita GDP. The constitutional article on the free and universal nature of education is a major attainment of the Russian nation and a key civic right that is truly applied in practice. About 44% of citizens consider the right to a free education to be a key civic right alongside the rights to free medical care, labor and life.

The aim of these constitutional norms is to assure social equity. All intermediate forms of financing are prohibited by law: either a child studies free of charge at a public school or his parents send him to a private school, which often charges high tuition and is accessible only to a few. The positive implementation of this norm is impossible without the full-fledged public financing of all study programs that the state has included in its sphere of constitutional responsibility.

This norm unequivocally stipulates that the principal types of education are free of charge (Fig. 11). However, in the conditions of the underfinancing of schools by the state and municipalities, the hindrance to formal financial relations leads to the **growth of fee-based extracurricular education and the emergence of “gray” areas of financing (school “dues,” tutoring by teachers)**. Both of them counteract the social equity mechanisms of school education.

The only one way out of this conundrum is **to normalize the financial backing of constitutional guarantees in education**. An analysis of the real expenditures of education institutions shows that the underfinancing of adopted public standards and targets amounts to 1.5–2% of the GDP on average. The alteration or outright disregard of these guarantees can lead to social tension: 60% of the Russian population objectively lacks the necessary resources for financing or even co-financing their children’s education at the desired level.

Figure 11. Percentage of financing by citizens in the total revenues of organizations in 2016 (2015 for preschool education)

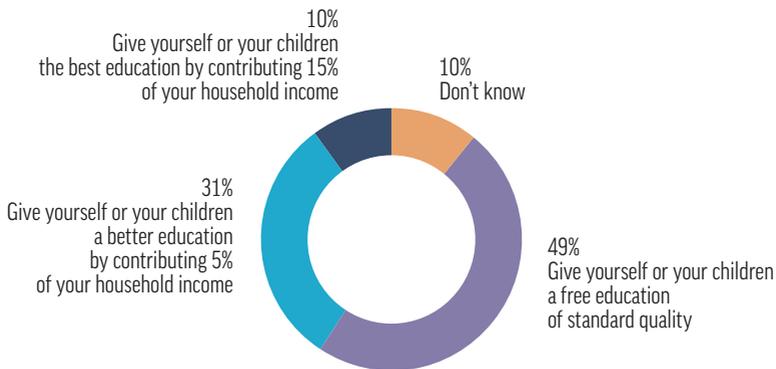


Source: Ministry of Education and Science of the Russian Federation.

The hypothetical scenario of “fee-based study” or even compulsory co-financing in public schools is unacceptable, as it would lead to the **growth of social stratification through education**.

The substitution of public financing by private resources is more socially sensitive in education than in healthcare or other sectors. At the same time, over 40% of citizens are ready to invest from 5% to 15% of their household income in better-quality education (Fig. 12).

Figure 12. Percentage of the Russian population aged 15–72 years opting for each of the following choices, 2016



Source: HSE survey.

We are not saying that this potential should be disregarded. However, household expenditures should be channeled, first and foremost, into extracurricular and continuing education (including short-term qualification programs) and co-financing secondary vocational and tertiary education programs. At the same time, **every expansion of the market of fee-based education products and services must be accompanied by special support programs that would provide children from low-income families with access to these markets.**

Thus, **education should be considered as the top and unconditional priority for social spending.** If we take a look at the gap between the minimum necessary and actual public financing of education and healthcare, we will see that it amounts to 1–1.5% of the GDP for education and at least 3% of the GDP for healthcare. This means that the budgetary maneuver available to Russia today is more apt to solve existing problems in education than in healthcare.

1.8. New Features of the Education System in 2030 That Will Assure the Growing Contribution of Education to Socioeconomic Development

What type of education system will be able to resolve all the aforementioned problems? Its main new trait will be a complex balance of unification and individualization. Unified digital platforms including tests, simulators and learning materials with student feedback will serve as spaces in which groups and individuals can follow unique study trajectories supported by professional feedback (including feedback based on big data analysis). These individualized trajectories will be united by networking and common core content. In addition, the “unpacking” of traditional organizational structures and rigid trajectories will lead to the growth of a flexible education ecosystem bringing together traditional organizations and providers

of individual education services. Education will not only prepare people for life in a changing and uncertain world but also become their constant companion and assistant. And, of course, the public education system will strive to assure the success of every child rather than only catering to students that cope.

1.8.1. Individualization and Digital Instruments

The education system is the “bridge” that should allow the Russian economy and society to enter the digital age with its new forms of labor and major new opportunities of human creativity and productivity.

We are already seeing the effects of digitalization on the labor market with the gradual displacement of routine elements of intellectual labor and the appearance of the corresponding new professions. This requires the education system to focus on the types of activities that will be necessary for successful careers 20–30 years from now and that will be based on the ability to work in a non-routine and creative fashion with well-developed communication skills.

At the same time, digital technologies are making a revolution in education itself. We are at the very beginning of this revolution when the traditional structure of education is still mostly intact. However, with regard to the range of problems that can be solved by new education technologies and to future changes in education itself, the digital revolution of the 21st century can be compared only with the appearance of the printed book and mass schooling in previous eras.

The changes will begin with the application to education of the same digital resources (tools, sources and services) that are being used in professional and everyday activities today. These existing technologies will make it possible to overcome traditional limitations that are familiar to all: the presence of children with different learning speeds in the classroom, the impossibility or difficulty for students to choose their teachers in schools and universities,

the lag of the technical equipment of vocational colleges behind industrial standards, and the impossibility of practically learning “expensive” state-of-the-art technologies in the education system. In other words, **digital technologies make it possible for the first time ever to individualize study trajectories and the methods (forms) and speed of assimilating study material for every student.**

At the same time, **the digital revolution undermines the traditional methodology of schools.** Already 5–7 years from now, almost every schoolchild will have access to the possibilities of artificial intelligence based on virtually unbounded cloud education resources. This will make a substantial part of existing school norms obsolete. The teacher will be unable to determine whether pupils did their homework themselves or with the help of electronic assistants. Compulsory schooling is coming to an end. **If we want the school to remain a key institute of education and socialization, we must change it qualitatively.** The future lesson must be based on the true interests of pupils, their constant motivation to participate in the study process, teamwork and practical activities. This, in turn, will require the broad use of game and project technologies (whether traditional or digital) in and out of class. On the one hand, digital learning management systems (LMS) will reduce the time that teachers spend on routine and bureaucratic work (such as checking homework) by up to 30%. This will radically change the teacher’s profession and make it more creative. On the other, LMS technologies will allow teachers to keep track of the achievements and difficulties of each student on a day-to-day basis and quickly react to learning difficulties.

An important consequence of the digital revolution is the unprecedented growth of accessible (and potentially useful) information in highly diverse forms (not only textual but also visual and audio information). This creates a **cognitive challenge** to students, constantly forcing them to find and select relevant and interesting

content and the means of rapidly processing it. Although few studies have been made in Russia so far about the impact of this civilization-al trend on individuals, it is clear that the means of interacting with information on which the present-day education system is based will undergo major changes. These changes will have an impact on cognitive skills and culture as a whole.

The opportunities for applying a broad range of tools for accessing, processing and inputting information have greatly expanded. While the cognitive transformation does not reduce the importance of knowledge, it destroys the role of traditional education institutes as its only source. These institutes are in a difficult situation today. It is important to help schools and other education organizations in their search for a reliable core content of education that would effectively transmit the cultural code. To this end, **the education system must learn to use the new technologies and virtually unbounded information resources.**

Virtual reality technologies make it possible to use digital simulators for learning any profession and acquiring any professional qualification, including qualifications that are needed for different jobs. This infinitely expands the range of teachable technologies, permits their assimilation in school, and gives a new lease on life to the system of secondary vocational and tertiary education.

The practice of online courses and blended learning (in which online courses are supplemented by in-class seminars, consultations and student assessments) creates virtually boundless educational opportunities. All of this opens the way to quality education for all individuals, regardless of where they live and study and of their interests and possibilities.

This key system area of education development — the individualization of the education process with the help of digital technologies — implies a series of other target characteristics of the system.

1.8.2. New System of Responsibility for Education

The new system of responsibility for education aims to optimize the use of resources, to eliminate losses in the education system and to draw upon the energy and resources of local communities, employers, parents and students. This system should have the following characteristics:

- Higher responsibility of students for choosing and successfully assimilating study programs. In secondary vocational and tertiary education, a high percent of students study in employer-sponsored programs. The attractiveness and flexibility of student loans are enhanced. The new mechanisms attract private resources into education in the amount of at least 0.25% of the GDP.
- Education results are recorded in a portfolio of both elective and compulsory objective assessments, including certificates and qualification exams (including exams based on international standards).
- Fee-based services are not permitted within the framework of the Federal State Education Standards for basic education. Co-financing mechanisms for basic and extracurricular education take the form of local taxes and levies. This attracts additional resources into education in the annual amount of 0.3–0.4% of the GDP.
- Reputational responsibility is enhanced in the tertiary education system (transition to in-house diplomas, renunciation of the state system of academic attestation, and broad introduction of professional-civic accreditation).

1.8.3. Motivational Educational Environment Supporting Initiative (Enterprise)

A motivational education environment that supports student initiative (enterprise) and independence should have the following characteristics:

1.8. New Features of the Education System in 2030 That Will Assure the Growing Contribution of Education to Socioeconomic Development

- The study trajectories of school students are realized in an integrated environment of formal and informal (extracurricular) education in the framework of modular network study programs based on a new infrastructure, including children’s science parks and centers along the Sirius and Artek models.
- The system is open to the initiative of students, who act as designers of study programs in all tertiary education and as creators of research, technology and social projects. Practical training and internships play a major role in study programs.
- Education at all levels makes use of new study formats (for at least half of study hours) in which students acquire not only subject (professional) knowledge but also key 21st century meta-subject skills and attitudes (cooperation, communication, creativity, capacity for self-study).

1.8.4. Education as a Sphere of Equal Opportunities for Realizing the Potential of Every Individual

To serve as a sphere of equal opportunities for realizing the potential of every individual, education should have the following characteristics:

- Families get support for children’s development from a young age (especially families with low social and cultural capital).
- 20% of school and vocational college students (children and young people with limited physical, social and cultural opportunities) have access to social mobility mechanisms.
- There are no dead-ends in the system: a flexible system of “study rehabilitation” (“second chance”) is put in place for children and adults that find themselves in difficult education or life situations.

1.8.5. Open and Flexible Lifelong Learning System

An open and flexible lifelong learning system should have the following characteristics:

- A network (including an online platform) bringing together suppliers of study programs and courses (education organizations), clients of different ages and education attainments, providers of objective competency assessments (including key meta-subject competencies), and employment agencies. A developed market of training programs and services financed by grants for small innovative businesses and non-commercial organizations.
- Multifunctional universities: research and education centers that conduct state-of-the-art research and implement flexible study programs at different levels, including secondary and continuing vocational education programs of different durations. They serve as platforms for the communication and cooperation of investors in new projects, businesses, scholars, local governments and innovative companies.
- Multidisciplinary colleges offering flexible study programs in secondary vocational education, professional training, and continuing education. They can serve as platforms for the certification of competencies.

The flexibility of the education system will be greatly enhanced thanks to a reduction in the fragmentation of study fields and a transition to the modular principle of program design (which will allow the “unpacking” of long linear programs into modules of different formats that will be assembled into individual study programs), the digitalization of the study process, and project-based learning with the participation of employers.

The involvement of employers will greatly increase thanks to a flexible system of incentives and preferences for companies that base their innovative technological and personnel development on investments in human capital through the education system.

Unpacking basic school and extracurricular education for children and vocational, tertiary and continuing education for adults will help to overcome the problem of continuity between levels of education that has traditionally affected the education system. The

individual design of study trajectories as a flexible set of modules and courses with an option of the certification of individual competencies will give students flexibility in managing their development trajectories to account for individual interests with the support of special education navigation services.

1.8.6. Education as an Instrument of Russian Global Leadership in Science, Technology and Talent Attraction

As an instrument of Russian global leadership in science, technology and talent attraction, education should have the following basic characteristics:

- Technology courses are an important and compulsory element of study programs at all levels of education.
- Consortia of universities, research organizations and businesses assure Russia's participation in all actively developing fields of science and technology: Russian universities are on the top 50 of all subject rankings.
- An effective system promoting the involvement of young people in research (master's — graduate study programs) is integrated with science and technology programs and attracts talented students from Russia and abroad.
- Sectoral technological universities and colleges are managed with the help of employers and integrated with corporate training programs and sectoral R&D programs.

1.9. How to Finance Education Development Projects?

Can one simply “add money” without changing anything in the existing structural makeup and working principles of the education system? This is no rhetorical question. In recent decades, both education workers and society have felt the impact of structural reforms, some of which were not backed by resources and led in certain cases not only to positive results but also negative side effects (the “gray”

industry of tutoring for Unified State Exams, the excessive paperwork of teachers, the elimination of salary incentives for teachers, the augmentation of university salaries by dismissing part-time faculty members, etc.).

Such reforms have evoked a sort of “public allergy” to organizational change. Thus, **the approach “reforms in the morning, money in the evening” can have very limited effect. It will not encourage hundreds of thousands of teachers and administrators at all levels to participate in education development projects. Without their support, reform will never be anything more than an imitation.**

Let us return to the model of “simply adding money.” Without a doubt, increasing financing will have a positive impact on schools. It will allow them to buy study materials and retrain teachers in an effective and systematic fashion. All of this will improve the quality of school education. The introduction of psychologist and speech therapist positions in schools and, most importantly, the reduction of routine in-class work for teachers will finally allow school students with perceptual and developmental disorders to assimilate the school curriculum in a sustainable fashion. Nevertheless, if learning technologies and organizational formats are not changed, such modernization will be exclusively extensive, leading to lower teacher-student ratios. The experience of leading countries (Scandinavia and Northern Europe) shows that, to attain significant positive effects, one must expand the size of the teaching staff by an amount corresponding to a 50% increase in school financing, i.e., an extra trillion rubles a year.

A simple “injection of money” will have less impact in secondary vocational and tertiary education, where human resources are the key limitation. In contrast to school teachers, one cannot turn university faculty members into the driving forces of the technological, social and cultural modernization of society by simply raising their

qualifications. One must develop research schools and inculcate the spirit of innovation and enterprise that is lacking at many Russian universities today.

A compromise between the two different approaches (“first reforms, then money” and “first money, then reforms”) is the **project approach**, which has been tested in recent years during the implementation of key public initiatives. This is the approach that we are proposing in the present book. It is based on the clear-cut selection of priorities on which both financial resources and the energy of all key stakeholders, including administrators, is concentrated. Financing is invested to attain qualitatively new results and elaborate new approaches in selected areas using a pilot (experimental) approach. These results are then institutionalized in new organizational structures and operating principles and introduced throughout the whole system. Successful examples of such education projects include the 5–100 Program, the Sirius Center, the WorldSkills movement, and the program for developing children’s science parks. An important principle of the project approach is the stage-by-stage approach. As a rule, national projects are preceded by a stage of design and testing. Without a meticulous assessment of impact, cost and returns, large-scale projects are a very risky undertaking.

1.10. Why Will It Work?

1.10.1. Main Principles

We propose a set of measures that would impact the principal “institutional nodes” of the Russian education system (understood as stable models of the real everyday practical behavior of key actors). We go by the assumption that a positive transformation of key institutes will trigger a transformation of the system as a whole at all levels and in all segments — both vertically and horizontally.

- The key points of impact are chosen on the principle that investments should give the greatest returns from the standpoint of

their effect on spheres lying outside education — first and foremost, economic growth, technological modernization, social stability and the country's global influence.

- The proposed projects should have the greatest possible potential for meeting the real demands of the main stakeholders in the education system. They should also have the greatest possible potential for attracting new stakeholders to the system and strengthening its ties with the socioeconomic and socio-cultural environments.
- The key resources of education are not books, computers or even teachers. The key resources and guarantees of success are the students themselves and their interests, efforts and participation. The activation of this resource should serve as the main criterion of the soundness of any recommendation for developing education.
- Key principles for launching new study programs are increasing flexibility, lowering barriers, and supporting networking, including digital networking.
- Administrative pressure and manual steering should be largely replaced by objective voluntary assessment and transparency.
- The Russian education system is considered to be among the best in the world today. We propose taking development measures that are based on the system's strong and globally competitive elements.
- At the same time, it is necessary to identify the areas in which Russian education is not very competitive. It is important to create new platforms in these areas (possibly, as enclaves in old structures) that would set new directions in their fields and to engage in international cooperation with an aim to attaining high ratings in the medium term.

1.10.2. Who Will Act as the Driving Force of Change?

The effectiveness of any project in the education sphere depends, first and foremost, on two factors: the motivation (interests, efforts) of **students** and the motivation and competencies of teachers and organizers of education activities (including the self-study activities of school and university students). The success of the proposed rapid intense transformations depends on **leaders** and their initiative. In each area of reform, special support must be provided to leadership projects (in the terminology of the Agency of Strategic Initiatives) and the innovations and initiatives of school and university teachers and education organizations.

In addition, success depends on the involvement of **directors of education organizations** in the implementation of the proposed measures. This will require not only advanced training but also a pre-established system of incentives aimed at attaining general indicators.

Finally, another key resource of the proposed transformations is **external stakeholders** — parents, organizations and free associations of citizens outside the education sector. Parents should be activated by a system of parent education and involvement in the study process and its assessment. Employers and civil society should be involved by expanding both opportunities set down by law and material and non-material incentives.

1.10.3. Accounting for Regional (Local) Particularities and the Role of Regions as Driving Forces in the Implementation of the Proposed Measures

In the conditions of high territorial diversity, regions will serve as key driving forces of the implementation of the proposed measures (including not only education organizations but also other state departments, regional business communities, municipalities and civil society). The roadmap for implementing the proposed

measures should classify regions into groups with similar socio-economic indicators. This typology shall serve as a basis for developing and pilot-testing concrete formats for implementing the proposed measures in regions in a way that would take local particularities into account.

To tap the positive transformational potential of regions, one should expand opportunities for regional initiatives that respond to local cultural, geographic and socioeconomic particularities. In particular, it would be expedient to create regional interdepartmental centers that would oversee the development and implementation of regional human capital development programs, including education at different levels, the labor market, migration policy, and other aspects that are significant for a given region.

1.11. Role of the Proposed Program Areas in the Implementation of National Projects

In early 2019, the federal government approved a series of projects in the framework of the national projects “Education” and “Digital Economy” in order to attain specific targets in these spheres as well as the nine national targets formulated in the Presidential Directive of May 7, 2018.

The project ideas proposed in the joint HSE and CSR report *Twelve Solutions for a New Education* of April 2018 were largely incorporated into the aforementioned federal projects. At the same time, the CSR’s recommendation on increasing financing was not entirely supported even in the scope of the so-called “inertial scenario.” For this reason, most of the proposed measures will be implemented either over a much longer time period or in an experimental regime or to a greatly reduced extent. This leads to the risk of an insufficiently strong impact. This risk is exacerbated by the fact that federal projects are implemented exclusively by government departments — in present case, the Russian Ministry of Education and Science that

1.11. Role of the Proposed Program Areas in the Implementation of National Projects

has essentially been split into three federal executive government bodies. Thus, it is particularly important not to lose a systemic vision of education reform, even if the prospects of its implementation are postponed by several years. In addition, this vision must focus not only on attaining national education targets but also and more importantly on attaining the national targets set forth in the Presidential Directive.

For this reason, Chapter 2 of this book presents a transformed, corrected and augmented version of the projects proposed in the report *Twelve Solutions for a New Education* as longer-term development areas of education with an outlook to the year 2030. Subsequently, Chapter 3 proposes concrete additions to the approved national projects.

Chapter 2

Key Areas for Transforming Russian Education into the Driving Force of the Country's Socioeconomic Development Until 2030

2.1. Areas of Transformation

2.1.1. Support System for Early Development

A. Description of the problem

As we showed in Chapter 1, one of the problem areas of our education is early childhood development. The share of children participating in preschool education in all age groups (from 2 months to 7 years) amounted to 57.29% in all of Russia in 2017, including 62.4% in urban areas and 43.27% in rural areas. However, the accessibility of preschool education for children aged 3–7 has had a negative impact on its accessibility for younger children. There were even cases of the closure of nursery centers in order to increase the accessibility of preschool education for children above the age of 3.

Nevertheless, children's development up to the age of 3 largely determines subsequent performance in school, which has, in turn, a decisive impact on success in life. The particularly high efficiency of investments in early development and preschool education in

comparison to other levels of education has been demonstrated by Noble prize winner D. Heckman. In an effort to enhance social stability and the quality of labor resources, many developed countries are actively investing in this developmental period and according particular attention to children from socially disadvantaged families, the children of migrants, and children with disabilities in order to correct problems in a timely fashion and prevent unfavorable development scenarios. While this area is not new to Russia, it is being implemented today in the domain of healthcare rather than education.

This is one of the reasons why teachers and pupils spend a lot of time and energy in the first grade on making underachievers catch up, which slows down the rate of assimilation of the material and lowers the motivation of children with a high level of social skills, imagination, and interest in learning.

As the experience of developed countries shows, the participation of children under the age of 3 in collective educational activities gives them a head start in life, while allowing economically active parents to resume work without a major loss of qualifications.

Flexible forms of preschool education (including part-time programs) at both municipal and private kindergartens and the development of small child care businesses have proven their effectiveness in Russia. In the conditions of the considerable socioeconomic stratification of the population, Russia needs to expand its systems of public preschool education, early psychological and pedagogical care, and the support of family rearing through parent education and involvement.

B. What should be done in the area “Support System for Early Development” by 2030?

Principal measure:

- creating a system of voluntary comprehensive psychological, pedagogical and medical care for children under the age of 3, including (at the family’s consent) consultations based on the professional monitoring of children’s development, early detection

of developmental particularities and problems, and possible remedial action, including the elaboration and support of individual programs for overcoming developmental problems (in particular, with the support of parents).

Pedagogical care will differ from the existing system of psychological, medical and pedagogical commissions (PMPC) in the following respects:

- orientation at the elaboration and implementation of sets of measures aimed at correcting negative developmental trends among children (providing assistance rather than simply making a diagnosis);
- orientation at applying psychological and pedagogical (and not only medical) methods for solving problems;
- system approach: coordinating the efforts of different specialists in education and psychology, attracting experts from other spheres, and creating conditions for the solution of child development problems faced by families; and
- accessibility for all families with children aged 0–3, irrespective of their financial status.

Steps for implementing the principal measure:

1) Creating a network of regional and municipal psychological and pedagogical care (PPC) centers (one regional center in each region of the Russian Federation plus a network of municipal centers). Regional centers will have the following functions: supporting the work of municipal PPC centers, elaborating model developmental programs and programs of working with children with developmental disorders. Municipal PPC centers will

- keep electronic child development records;
- interact with families with children aged 0–3;
- collect information about births and the state of health of newborns, infants and young children from medical organizations (maternity hospitals, perinatal centers, and children's polyclinics);

- collect information about specialists at the regional center and specialists who are not on the staff of the regional center yet might be useful for families and children;
- employ the following specialists: early development teachers, psychologists-counsellors, psychologists-neonatologists, psychologists specializing in working with children with disabilities, neuropsychologists, etc.;
- organize universal compulsory psychological and pedagogical diagnostic programs (with the parent's consent) and analyze their results;
- interact on a standing basis with psychological, medical and pedagogical commissions (PMPC) to establish the health status of children and develop rehabilitation programs; and
- create a social support service whose personnel will assure the everyday needs of families. This service shall help families to meet their everyday needs and acquaint family members with child rearing techniques. Certain Russian practices have proven to be effective at preventing social orphanhood (the removal of children from families). In these practices, a social worker (most often, a respected female inhabitant living in the same or a neighboring locality) enters a family in the risk group (a family that is excluded from the community, has no contacts with grandparents, suffers from alcoholism or drug abuse, etc.) in order to help it organize its everyday life, get acquainted with normal child rearing practices, maintain the family budget, etc. Such "co-habitation" lasts for about two months, after which the social worker gradually leaves the family, letting it take the initiative itself.

2) Introducing a system of electronic developmental records for children aged 0–3 (these records will be kept on a special electronic platform with a system for protecting personal data).

3) Organizing training for specialists: designing study programs at teacher training universities, approving and offering a federal training and retraining program for preparing specialists for PPC centers.

Other measures in this area will include

- fostering a system of parent training (system of co-learning and distant consulting, clubs for mothers and fathers, consultations with municipal professional support services) with the help of NCOs and education organizations (with grant support);
- designing and introducing digital platforms for monitoring child development with the help of individual electronic records (at the parents' consent) and tying them to personalized financing mechanisms;
- providing access to early development programs for children from families with low economic and cultural capital, giving priority access to nursery schools and extracurricular education programs for children from one-parent families, multi-child families, families of migrants, and families of handicapped parents; expanding preschool education services (nursery schools) to children aged 2–3 years and reducing the unmet demand of families for nursery schools in order to help mothers return to active employment without the loss of qualifications or with reduced expenditures for acquiring new qualifications; and
- expanding care and development programs for young children with group activities furthering communication, play, and other forms of socialization that are particularly effective for developing 21st century skills and attitudes necessary for success in life, especially short-term groups at private and municipal kindergartens (with professional support for program design and active use of modern game technologies).

C. Results of measures in the area “Support System for Early Development” by the year 2030

Immediate results and direct quantitative indicators of their attainment by 2030:

1) reduction in the percent of children with disabilities in the first grade of school

2) access for families with preschool children to parent training programs (for 100% of interested families)

3) universal accessibility of the system of professional child care and development services for children up to the age of 3

4) all children aged 0–3 have electronic development records with the results of psychological and pedagogical diagnoses

Mediated economic effects:

1) reduction in the percent of potentially underachieving school-children and growth in the effectiveness of state spending on primary education (thanks to the more effective use of the time allocated for learning the school curriculum)

2) economy on the increased (by a factor of 2) per capita financing in primary school thanks to a reduction in the percent of children with disabilities in the first grade of school

3) future economy on social spending thanks to a reduction in antisocial behavior

Other mediated effects:

1) increased well-being of young children of the preschool age

2) increased social mobility for children from disadvantaged families

2.1.2. School of the Digital Age

A. Description of the problem

One of the key problems of modern Russian schools and extracurricular education is their growing lag behind the demands of modern life in the conditions of the digitalization of the economy and the main social spheres (see the detailed discussion in Chapter 1). This lag has several aspects. First of all, schools do not make use of effective digital tools that are already being employed by children and adults in many other spheres. Secondly, schools do not draw upon digital technologies for

- personalizing study (choice of trajectory, multiplicity of learning materials, support for academic problems);

- increasing student motivation (interactive learning materials, educational games); and
- reducing the routine work of teachers and administrators (monitoring, record-keeping, checking homework).

The new digital technologies can be used to achieve key education goals that Russian schools have trouble attaining (or are unable to attain) with the means of traditional technologies.

These goals include:

- intellectual and emotional involvement of all schoolchildren in the education process thanks to the transformation of learning methods, including the introduction of game, project, competitive and team methods based on digital instruments;
- sustainable attainment of adequate education results by “under-achieving” students (students with perceptual and behavioral problems);
- early and adequate support for gifted schoolchildren;
- reducing the routine workload on teachers to give them more time for creative and pedagogic work;
- expanding access to education resources in schools; and
- using modern digital technologies for expanding the choice of industrial and other qualifications of the real economy.

These goals can be attained only with the help of digital transformation whose essence lies in the maximum use of new technologies for improving the quality of education and creating new learning outcomes meeting the demands of the “digital age.” Russia is far from being a leader in this domain. According to the last ICILS survey (2013),

- Russia ranks 8th out of 21 countries in computer and information literacy.
- Over 35% of Russians aged 25–64 lack basic computer skills (in comparison to only about 8% in Sweden and Denmark).
- 9% of Russian schoolchildren have not attained level 1 and only 24% have attained levels 3 or 4 of literacy (in comparison to 3% and 37%, respectively, in the Czech Republic).

- Only 18% of urban schools and 7% of rural schools in Russia have high-speed Internet access.
- Only 2.63% of Russian schoolchildren use distant education technologies in the learning process.

A traditional weak point of the Russian school system is the ability of children to apply acquired knowledge in practice (this is shown, in particular, by their significantly lower scores on PISA tests than in TIMMS and PIRLS studies). Russia can improve its results by overcoming its archaic industrial format of organizing the learning and development process and by gradually shifting to a digital personalized study format.

The basic problem of the learning and development process in Russia is the industrial (“factory” or “head-on”) approach to learning and development and the assessment of education results, which greatly restricts student choice. This leads to academic failure among over a fourth of all schoolchildren (who do not receive the necessary support for assimilating the core program) and discouragement among almost a fourth of motivated and academically successful students (who are not assigned more complicated problems that correspond to their abilities).

The main indicators of the digital transformation of education include

- use of digital resources, instruments and services in the study process (in particular, for communicating, retrieving and assimilating study materials, assessing education results, etc.);
- immersing schools into the digital environment; digital monitoring of the study process and results with an aim to personalizing study; and
- personalizing trajectories and instruments of assimilating study materials.

This will lead to the following results:

- expanding the learning space beyond the boundaries of education organizations;

- transforming the teacher's role from a storehouse and communicator of knowledge to a mentor of learning and development;
- assimilating and consistently using curricular design procedures; renewing the working methods of education organizations; and
- shifting from learning as “covering material” to learning as “developing competencies” — in particular, with the use of digital instruments by students for implementing project work, setting goals, planning attainment, and assessing the success of this work.

The proposed measure is connected with the attainment of the goals of the “Digital Economy” program.

B. What should be done in the area “School of the Digital Age” by 2030?

Main measure:

- Transition to totally new digital learning and teaching complexes (DLTCs) that will partially or fully supplant traditional textbooks. Thanks to the technologies of artificial intelligence and expert systems, these complexes will be adapted to the individual needs of students, assuring the successful assimilation of material by average, underachieving and overachieving groups of students and students with marked perceptual preferences (e.g., predominantly visual or predominantly logical thinking). The digital complexes shall also be used to create and apply **objective grading and feedback systems** for all school subjects, for both ongoing and final assessment. These complexes will enable the creation and diffusion of regularly updated **cloud education resources** for schoolchildren, parents and teachers (databases, video materials, educational games, online tests and lesson scenarios).

Thus, the DLTCs will serve as a basis for constructing a new model of the learning process that will make full use of the possibilities of contemporary education technologies and variative learning and teaching forms at all levels of education with personalized study opportunities assuring a high-quality fundamental education and the all-around personal development of all students and giving them a

sustained motivation to learn. The first education organizations to assimilate these technologies will subsequently share with other organizations their teaching experience, including

- technologies for developing intraschool norms of education results and level-based differentiation
- instruments of ongoing and final assessment
- models of teacher support and management of L&D work
- new operating rules for education organizations

The transition to DLTCs will require the elaboration of a new regulatory framework for the digitalization of education, including

- new version of Federal State Education Standards
- standards for the Basic State Exam
- standards for licensing and certifying education organizations
- new version of sanitary and hygienic regulations
- financial support measures for education stakeholders who purchase IT technologies
- standards for network education formats, including external online courses and certificates, etc.

Additional measures in this area:

- Creating a system of filtering search engines for recommending and promoting the best and safest open online resources for education.
- Developing, testing and mass-introducing digital educational games and digital simulators promoting the active involvement of schoolchildren in the study process and their participation in team and individual competitions. These tools can be included in the traditional school curriculum based on existing standards and textbooks and serve as a transition format allowing teachers to assimilate new teaching methods before the broad introduction of digital learning and teaching complexes.
- Introducing modern technological solutions for the radical simplification of record-keeping and the reduction of the routine work of teachers and administrators at all education institutions.

- Introducing new types of contracts with providers of digital education resources (DERs) for general secondary schools that involve not only the sale but also the support of resources over their entire lifecycle. This requires training and certifying teachers for working with the new resources, providing ongoing consultations for teachers, organizing and supporting project teams, and involving teachers in the development of learning modules and other education resources based on the DERs.
- Creating, regularly updating and promoting open online courses by the best school and university teachers in core and specialized subjects of basic and upper secondary education and extracurricular education – in particular, for children that are incapable of attending such courses in school.

C. Results of measures in the area “School of the Digital Age” by 2030

Immediate results and direct quantitative indicators of their attainment by 2030:

1) 100% of schoolchildren participate in personalized study trajectories designed with the help of modern digital learning and teaching complexes and cloud resources and evaluated with the help of objective assessment formats, which should raise the share of 9th grade graduates that can use knowledge effectively (in mathematics, science and Russian as measured by the PISA methodology).

2) DLTCs shall be developed and introduced in all subjects of the general school curriculum (at least 2 DLTCs in each subject to provide a choice) and in all specialized and extracurricular subjects of basic and upper secondary education (in particular, for promoting project work that combines two or more subjects).

3) Digital games and simulators shall be developed and introduced in all subjects of the general school curriculum (it will be possible to use them with traditional textbooks initially).

4) 100% of teachers have certificates attesting their qualifications in the digital education environment, and 100% of teachers of

subjects in which DLTCs have been introduced have the necessary qualifications. At least 35% of teachers get salary bonuses for developing new digital education resources. 80% of teachers are involved in networking communities on using and developing new DLTCs, games, simulators and other education resources.

5) 100% of schoolchildren have access to open online courses in the subjects of the general school curriculum. 50% of 8th–11th grade pupils take open online courses with the possibility of obtaining certificates of course completion.

6) 100% of teachers spend 30–70% less time on routine and bureaucratic work.

Mediated economic effects:

1) reduction in the share of potentially underachieving schoolchildren (thanks to personalized study programs) leading to lower public spending on healthcare, law enforcement, welfare, etc., for high-risk groups;

2) increasing share of schoolchildren with top education results, including scores on international education quality assessment programs, leading to a higher productivity of the labor force and the economic growth of the country as a whole; and

3) liberation of additional resources thanks to a reduction in spending on routine and bureaucratic procedures in the education system.

Other mediated effects:

1) growing parent satisfaction with the education system thanks to comfortable study conditions for children

2) growth of student satisfaction with life and school thanks to personalized study

3) maintaining and improving children's health thanks to lower stress on account of personalized study

4) improved social mobility thanks to the possibility of accounting for the individual traits of children in the study process

2.1.3. Contemporary Infrastructure of Children's Education

A. Description of the problem

Preschool education

The key infrastructural problem in preschool education is accessibility. The problem of accessibility has two aspects: the availability of places in the preschool institutions, on the one hand, and the means of bringing children to these institutions, on the other.

Despite a fairly high accessibility of kindergartens for children over the age of 3, the demand for nursery schools for children up to the age of 3 has not been met (over 300,000 places are lacking for children aged 2–3 alone). This reduces early development opportunities and hinders mothers from participating in labor activities.

Over 30% of families bring children to public (municipal) kindergartens by car, and 10% by public transportation. The situation with regard to private kindergartens is more acute: about 70% of families have to use transportation to bring their children there. The rules¹ regulating the accessibility of preschool, school and extracurricular education are often violated today, posing a threat to children's safety, health and comfort, especially with the development of the private sector and the creation of school complexes in which preschool organizations are included.

¹ Regulations SP 42.13330.2011 "Urban Planning. Planning and Developing Urban and Rural Localities" specify that all inhabitants must have education organizations located within walking distance (Item 10.5). The routes to the education organizations must not have any grade crossings with arterial roads (Item 10.4). These regulations were adopted by the Russian Ministry of Regional Development in December 2010 pursuant to the Federal Law "On technical regulation" and represent an updated version of the Urban Planning Regulations SNiP 2.07.0189*. A recommendation on the availability of education organizations within walking distance also figures in the "Sanitary and epidemiological standards for the conditions and organization of study in general education organization" approved in December 2010 by a resolution of the Chief Sanitary Inspector of the Russian Federation (Item 2.4).

There is a big difference between going to school by foot and by transportation, as the latter requires extra measures for organizing the conveyance of children with public or private transport. Each of these cases entails special requirements for the location of the facilities and for their surrounding territories. Kindergartens and school complexes with preschool organizations seldom have parking lots and drop-off zones for children and accompanying adults. This necessitates changes in planning and building regulations and the reconstruction and capital renovation of access roads and surrounding territories and the organization of traffic.

School education

The Russian Constitution guarantees free general education. Over the past 10 years, the implementation of the priority project “Education” and the project for the modernization of regional general education systems has led to qualitative improvements in education infrastructure (cf. Chapter 1): the number of education organizations meeting contemporary standards has increased; the number of derelict buildings in need of capital renovation has fallen; and great strides have been made in the computerization of the study process (Internet access for education organizations, purchase of computer equipment).

At the same time, demographic growth and problems linked to the underfinancing of education in the 1990s have created a shortage of infrastructural capacity in many regional schools. A critical situation has emerged in regions with high demographic loads and low levels of education spending (North Caucasus) and in northern regions where the provision of education is fraught with additional problems stemming from geographic and climatic factors. The whole system is facing the risk of ageing infrastructure on account of the need to mobilize financial resources for teacher salaries (in order to implement the 2012 Presidential Directives).

Thus, in view of the growing number of schoolchildren, it is necessary to accelerate the construction of a large number of new school

buildings to enable all pupils to study during the first shift and to provide educators with contemporary teaching infrastructure.

At the same time, some Russian territories continue to face a demographic crisis of a different kind: underpopulation. This calls for the continuation of the program of developing school buses (launched by the priority nationality project “Education”) and the intense digitalization of education and education management at all levels. Another important task is to set up an infrastructure for personalizing learning, inculcating “new literacy” and 21st century skills, and digitalizing the study process and education management.

The architecture and layout of Russian education organizations and the lack of new functional standards for new school buildings and learning areas have led to the conservation of archaic learning practices, hindering the creation of conditions for mobility and the personalization of the learning process, the organization of effective communication with students and their families, and the introduction of new education methods. New school buildings should enable students to engage in project and research work as well as enabling the digitalization of education and the introduction of new teaching models for the subjects “Technology” and “Art,” specialized study tracks, vocational education, social practices, career orientation, and extracurricular activities for students.

One of the factors hindering the development of contemporary infrastructure is the lack of competition on the market of study equipment, education information and management systems, and electronic L&D products. The federal government must set down clear rules of the game and take into account the real needs of teaching teams and their demand for high-quality study equipment and materials, textbooks and teaching aids when making procurements, assuring the competitiveness of purchase procedures despite the complex nature of the products.

Extracurricular education

To offer modern programs of technology education, career orientation, and creative activities and programs for gifted children, the infrastructure of extracurricular education (including children's camps) requires even greater modernization, as it has not been covered by national projects so far. Launching federal projects would be an important step that could change this situation on the condition that they are co-financed by regions and through public-private partnerships. Moreover, one must support private initiatives in the sphere of non-formal science education and career orientation (science museums and parks, exploratoriums, "career villages," etc.). It is important to solve the problem of the unequal distribution of extracurricular education resources, which are more accessible to children from affluent families. The new opportunities must also be open to children from families with low socioeconomic and cultural capital.

A very important aspect is the introduction of contemporary models of network interaction between educational, cultural, sport, business, and research organizations — in particular, the collective use of equipment and premises to assure the accessibility of new resources for the greatest number of schoolchildren. In particular, one could create new models of social, cultural and educational organizations. New buildings could serve as platforms for such interdepartmental sociocultural centers in regions.

B. What should be done in the area "Contemporary Infrastructure for Children's Education" by 2030?

Principal measures:

- 1) annual creation of new places in preschool institutions for nursery-age children;
- 2) providing schools with high-speed Internet access to allow 100% of students to use modern Internet resources simultaneously (at greater speeds as technologies improve) and creating a modern digital school infrastructure (network resources, computer classes, Wi-Fi);

3) creating a modern education environment in existing schools with the help of interior design and new furniture and equipment;

4) constructing new modern school buildings for eliminating school study in the second and third shifts;

5) capital reconstruction of schools that lack the required study conditions;

6) infrastructural modernization for creating integrated cultural, educational and sports organizations in rural areas and small towns;

7) providing safe transport for rural schoolchildren to large regional schools by replacing school buses that are over 6 years old and regularly repairing all school buses;

8) elaborating contemporary standards for the accessibility of preschool, school and extracurricular education in the planning and development of urban and rural localities, for transport infrastructure assuring children's safety, and for optimal school location and comfort; elaborating and updating functional standards for buildings to take new education practices into account; revising the technical regulations (SanPiNs, SNIps, etc.) for new buildings to bring them into line with new functional standards and best education practices;

9) constructing new buildings with contemporary spatial organization, design, and learning equipment (including laboratory equipment); establishing education organizations that effectively integrate programs from different sectors and levels of education as well as organizations providing comprehensive educational, sport and cultural services;

10) elaborating "mobile education" models for remote territories ("mobile teacher," "mobile laboratory," "mobile science park," etc.) and developing the infrastructure of digital education;

11) creating and supporting a Unified National Electronic Navigator Platform allowing citizens to choose study programs on their own on the basis of their personal and professional needs as well as general education programs and job placement services; and

12) developing the infrastructure of informal and extracurricular education:

- constructing and reconstructing buildings and providing contemporary equipment for extracurricular education organizations, education technology support centers, children’s science parks, youth innovation centers, etc.;
- supporting projects in the sphere of informal education by businesses and non-commercial organizations offering children’s recreation and summer vacation activities (favorable terms for leasing premises, interest rate subsidies, concessions, discounts on public utilities);
- providing opportunities for using social infrastructure (premises and equipment) for implementing independent public initiatives and projects (family and mixed-age clubs, creative spaces, educational events); and
- using public-private partnerships to develop infrastructure for informal and extracurricular education; introducing models of “technological internships” for students in lower and upper secondary schools (introduction to modern technologies, immersion in technological environments, simulated work settings, manufacturing activities) with the help of the infrastructure and personnel of the high-tech extracurricular education sector (of the “Quantorium” type) at vocational education organizations and manufacturing companies or with the help of mobile units (mobile labs, mobile science parks).

C. Results of measures in the area “Contemporary Infrastructure for Children’s Education” by 2030

Immediate results and direct quantitative indicators of their attainment by 2030:

- 1) 100% of families with children between the ages of 2 and 3 are able to send their children to a nursery school, if they desire.
- 2) 100% of schoolchildren study in a single shift.

3) Greater accessibility of modern forms of extracurricular education for rural schoolchildren.

4) 100% of schoolchildren living in rural areas have access to safe transportation to education organizations.

5) All Russian schools will have Internet access at a speed that assures simultaneous Internet use by 100% of the student body by 2030 (expected speeds of at least 1 Gb/s) as well as the necessary resources for paying for this traffic.

6) 100% of schoolchildren use modern education online services (applications, simulators, etc.).

7) 100% of schoolchildren participate in different forms of extracurricular education.

Mediated economic effects:

economic growth thanks to the development of industries producing learning equipment and tools and the increasing volume of fee-based services in informal and extracurricular education.

Other mediated effects:

1) children receiving a safe high-quality education thanks to the contemporary organization of transport accessibility through the optimal location of education organizations, the development of transport infrastructure, and the accessibility of high-quality study programs to children living in all areas;

2) enhancing social stability by satisfying the demand of citizens for safe and comfortable study conditions for their children; and

3) improving the quality of life in Russian regions and remote territories through the integrated development of transport and the information and communication infrastructure during the implementation of education projects; reducing state expenditures through the introduction of contemporary technologies, including energy-saving technologies.

2.1.4. Equal Education Opportunity and Success for All

A. Description of the problem

Numerous studies in Russia and abroad have shown the dependence of a child's academic success on the socioeconomic and cultural status of his or her family. For example, 21% of schoolchildren whose mothers do not have a tertiary degree failed to get a passing PISA score in mathematics, while the same indicator for schoolchildren whose mothers have a tertiary degree is almost twice as low. Most poor families are families with children, and the growing poverty risk may lead to a lower quality of education among the new generation.

In Russia, indicators of equal opportunity in school (the gap in education performance between different socioeconomic groups of schoolchildren in accordance with OECD criteria) are roughly equal to the OECD average. However, the share of so-called “resilient children” (according to the OECD methodology), i.e., children from low-income social groups attaining high levels of functional literacy, is lower in Russia than the OECD average. This shows the poor effectiveness of the education system as a “social lift.”²

Thus, Russian education does not solve the problem of the factual inequality of education opportunities. Moreover, as we have already mentioned in Chapter 1, the overall level of academic failure is unacceptably high (over 25% of 15-year-old students do not have a minimum level of functional literacy in any area). Although the share of such children has fallen from its 2006 level (40%), this remains a major problem for country's economic growth and social prosperity. Schoolchildren who do not attain a basic level of functional literacy are more subject to unemployment, criminalization, social diseases, and low life expectancy (see Chapter 1). The country's economy will

² The PISA study (OECD) uses the term “resilient” to refer to schoolchildren with an unfavorable socioeconomic background who nevertheless managed to get high scores on functional literacy tests.

not receive a workforce with the necessary level of qualifications and labor productivity, and spending on welfare, healthcare and the penitentiary system will grow.

These problems stem from the lack of system measures for reducing academic failure accumulated by certain student groups and improving the low learning activity of schoolchildren resulting from the limited opportunities of their families (in comparison, over 30% of schoolchildren in Finland get individual support at different stages of education for the purposes of overcoming academic difficulties and failure).

In the European Union, USA and China, education policy focuses on bridging the gap between the education results of schoolchildren from different socioeconomic groups. Measures for overcoming education inequality are systemic in nature, marked by continuity and large-scale coverage (national programs), based on a legislative framework, and backed by ample financing. They often involve cultural organizations (such as museums) that provide free education programs. In addition, the projects for reducing inequality and improving the education chances of children from low-income families get broad support in society and are initiated and implemented by charitable foundations as well as by the state.

During the Soviet period, our country was a model of effective education policies assuring equity and equality. However, this area does not get broad support in society today and is not a priority for the state, charitable foundations or social NCOs.

Up to one half of school underachievers are concentrated in 25% of schools, which has a negative impact on their studies and serves as an additional hindrance to social mobility. As a rule, such schools (which account for over 20% of all schools) are located at the periphery of cities in districts with a high concentration of families with limited social and economic opportunities. Today, the gap between this group of schools and good schools (the “school segregation index” in OECD terminology) is higher in Russia than in leader

countries.³ Such schools require target support. The 2014–2016 state support program for these schools did not yield any major results on account of the low financing allocated for a program of such scope.

As a rule, these schools lack education psychologists, social care teachers and counsellors, while teachers do not have the necessary training for working with special categories of schoolchildren. These children require special attention and support in order to assure the accessibility and high quality of education.

Since the early 21st century, Russia has implemented projects for supporting rural schools and schools in remote areas. The goals of assisting low-performance schools functioning in unfavorable social conditions and teachers working with children from socially disadvantaged families are set out in Presidential Directive #599 of May 7, 2012, and other documents.

However, the projects that have been implemented so far are mostly local (covering isolated territories and fields of activity) and highly departmentalized. These projects have not received the required regulatory or financial support at the federal and regional levels.

The broad development of the sector of extracurricular education in recent years has created new opportunities both for supporting talented students and for overcoming underachievement, yet much of this sector is fee-based.

According to the Russian Federal State Statistics Service, 17.5% of extracurricular education services provided to Russian citizens in 2017 were fee-based. A survey of parents of children attending classes in extracurricular education organizations showed that only half of them (51.6%) study for free, while another 18.1% do not pay tuition yet must cover other study costs. Thus, children from economically disadvantaged families have fewer opportunities to develop their talents than children from well-to-do families.

³ Calculated using data from international comparative studies of education quality based on the OECD methodology.

Another hindrance to social mobility arises for students entering vocational colleges after the 9th grade. A substantial share of these students come from families with limited social and economic opportunities. Vocational colleges have much poorer core education programs than upper secondary schools, yet these are precisely the programs that give students the necessary universal skills for life-long study and success.

The education systems of many countries have mechanisms of socioeconomic equalization offering target academic assistance to underachieving students as well as admission advantages and financial support for students from low-income families wishing to enroll in study programs. Such mechanisms had existed in the Soviet Union, too. Today, it is necessary to introduce analogous instruments adapted to the new socioeconomic conditions.

B. What should be done in the area “Equal Education Opportunity and Success for All” by 2030?

Principal measures:

1) Giving each child the opportunity to take a year-long school preparation program (in a convenient format at the family's choice).

2) Target support of education initiatives for children from low-income families, including free supplementary classes on subjects of the school curriculum; free extracurricular education programs, summer schools, and programs at leading children's centers; and special courses during vacations (in particular, at leading schools and universities).

3) Establishing a comprehensive system for preventing and correcting academic failure among students in different risk groups that would take the specific problems of each school into account (with particular attention paid to schools with sustainably low academic results), including supplementary classes, psychological and pedagogical support, and counseling. A comprehensive system for preventing and correcting academic failure includes the following measures:

- introducing comprehensive instruments for monitoring academic failure (including individual progress) at schools;
- creating the position of a school specialist (teacher, social care teacher or tutor) in charge of identifying students with a high risk of academic failure, elaborating individual support programs, providing assistance, and coordinating the work of teachers;
- free participation of underachieving students in classes for “catching up” with the main subjects and preparing for exams (including the use of online courses);
- free programs for developing the skills of self-organization, self-regulation, successful study, and setting and attaining individual goals; and
- creating state-of-the-art digital support services for children to assure the personalization of study and academic progress: adaptive learning, simulators, and AI tutors (see also Area 2: “School of the Digital Age”) and training teachers to use special strategies of working with underachieving students.

4) Programs for improving the performance of schools working in a difficult social environment, including the improvement of their material infrastructure and the creation of additional jobs for educators, social care teachers, psychologists and tutors. Such programs entail

- including in-demand specialized study programs and extracurricular programs in the curricula of schools working in a difficult social environment in order to make them more attractive for families and preventing and reducing social segregation;
- implementing career counseling, pre-vocational training and social work programs that take the specific features of the territory into account;
- programs for integrating and socially adapting children from migrant families (including children learning Russian as a foreign language);

- developing the infrastructure for offering high-quality physical education programs and promoting a healthy lifestyle; and
- establishing organizations that integrate general, extracurricular and vocational education and personal development (“education complex” or “center of educational opportunities”) and comprehensive organizations or sociocultural complexes that provide education, sport and cultural services on an interdepartmental basis at existing schools (see also Area 3: “Contemporary Infrastructure for Children’s Education”).

5) Modernizing general education programs and introducing Unified State Exams in general subjects for vocational college students.

6) Reforming the scholarship system at universities: student aid scholarships should be awarded only to truly needy students and amount to 80% of the regional minimum wage.

Mandatory conditions for measures implemented in this area:

1) accounting for the specific features of each territory (region, district, and even local culture);

2) taking a differentiated approach to allocating financing to schools that accounts for all the forms of assistance they receive (including target assistance to the students themselves); and

3) employing objective assessments for allocating funds (increased standard financing, grants) and clear-cut requirements for the effectiveness and targets of using funds and monitoring effectiveness with direct consequences for the administration of education organizations.

This area is interdepartmental in nature, calling for cooperation between the education, healthcare, culture and sport sectors.

C. Results of measures in the area “Equal Education Opportunity and Success for All” by 2030

Immediate results and direct quantitative indicators of their attainment by 2030:

1) The percentage of children that are insufficiently prepared for school halves.

2) The percentage of 9th grade students that successfully assimilate basic functional skills rises to 90%.

3) The equality of opportunity in school (the gap in academic achievement between different socioeconomic groups of students) attains the level of the top 7 countries.

4) The dropout from secondary vocational programs due to academic failure in the general secondary curriculum decreases.

5) The percentage of disadvantaged students (students from low-income and low-education families) that get tertiary degrees (among the total number of disadvantaged students admitted to universities) grows substantially.

6) The percent of 15-year-old students that lack the “new functional literacy” in accordance with OECD criteria falls.

7) Russia joins the group of countries with a low level of school segregation.⁴

Mediated economic effects:

1) increasing labor productivity due to higher-quality human capital;

2) higher rate of introduction of innovations into the economy due to the higher functional literacy of the population; and

3) lower spending on social transfers and other expenditures related to the support of vulnerable, economically unsuccessful and marginal groups thanks to the reduction of the share of these groups in the makeup of the Russian population.

Other mediated effects:

rising cultural level of the population, greater public trust, and lower crime rate.

⁴ Calculated using data from international comparative studies of education quality based on the OECD methodology.

2.1.5. New Technology Education in General and Vocational Schools

A. Description of the problem

Up until recently, the renewal of technology education has been at the periphery of education policy despite the fact that the implementation of the Scientific and Technological Development Strategy of the Russian Federation calls for radical changes in the situation. This is particularly true of the sphere of digital technologies (information and communications technology – ICT), as shown by the fact that most key areas of the National Technology Initiative are based on ICT.

The main reason for the low technological competency of the population and the low popularity of technical majors among strong school and university students is the growing lag of the school curriculum behind the latest technological developments. In most schools, technology class has not changed for decades. In extracurricular education, only 7% of children take part in technology-related programs. Technological competencies offered by the secondary vocational and tertiary education systems do not meet the demands of today's labor market even at the regional level. The formats of technology education at vocational colleges and universities are also outdated: long inflexible programs are ill-suited for keeping up with today's rapidly changing technologies.

In Russia, 14.9% of the population over the age of 16 ranks below level 1 (the lowest level) in problem-solving skills in a technologically complex environment (in comparison to the OECD average of 12.3%). Only 8.2% of higher secondary school students choose technology among the different specializations offered by their schools. Only 5.5% of students involved in extracurricular education take technology or combined sports & technology courses, which are among the most unpopular areas among schoolchildren.

Technology classes should play a central role in the general and extracurricular education systems. They should make use of the

traditions of Russian math and engineering education, which are recognized worldwide.

Technology should become the center of multidisciplinary (physics, biology, chemistry, mathematics, art) project activities in school, the main area for inculcating 21st century skills, and a space of interaction between schools, local employers and civil society (in particular, for creating and applying digital products for external clients). Here one can also involve students in the development and support of the school infrastructure and the digital competency of teachers.

Preparation for high-tech professions and specializations requires a contemporary laboratory and manufacturing infrastructure. Today, the share of public funds used by colleges to purchase equipment amounts to only 1.5% of all public resources allocated for financing secondary vocational education. The share of non-government revenues in the budget of secondary vocational education organizations amounts at most to 12%, including a contribution of under 4% by employers. Moreover, programs preparing students for technology professions and specializations are not prestigious, and the teaching staff is often quite weak.

A negative selection is taking place on the labor market of technology-related professions. This is particularly evident if one compares the education systems and economies of Russia and, say, Germany or, more generally, Northern Europe. This situation is totally unacceptable given the need to bolster the development of construction, industry, agriculture and other technology-related industries.

B. What should be done in the area “New Technology Education in General and Vocational Schools” by 2030?

In children’s education:

1) Radically updating technology education in schools and extracurricular education organizations by modernizing the content of study programs in science, computer science and technology, creating modern technology workshops, networking with colleges, universities and Quantorium children’s science parks, and introducing new

formats for assessing the results of technology education, including school competitions and specialized Basic State Exams and Unified State Exams (see also the related Area 2 “School of the Digital Age” and Area 3 “Contemporary Infrastructure of Children’s Education”).

2) Offering up-to-date technology courses (including ICT and digital literacy) in the general and extracurricular education systems and modernizing the content and teaching of related general education courses with the use and development of technological knowledge and competencies (in particular, math and science).

3) Creating, testing and introducing modern simulator hardware systems with the corresponding digital software and teaching complexes (in particular, systems based on virtual reality technologies and computer role-playing games) to give general school students an overview of contemporary technologies and in-depth knowledge in certain fields.

4) Creating (with the help of public-private partnerships) an infrastructure for teaching modern technology courses; introducing models of “technological hands-on experience” for lower and upper secondary students (introduction to modern technologies, immersion in technological environments, simulated work settings) with the help of the infrastructure and personnel of the high-tech extracurricular education sector (of the “Quantorium” type) at vocational education organizations and manufacturing companies or with the use of mobile units (mobile labs, mobile science parks).

5) Mass development (using crowdsourcing methods) of learning and teaching complexes in the subject field “Technology,” testing them in the general and extracurricular education systems, and offering them in open access. These complexes should teach basic data processing skills, including big data analysis and contemporary computer languages; construction, modeling and design; and the basic elements of the manufacturing technologies of the future, adapted to the school’s region (together with local companies and vocational education organizations).

6) Introducing different forms of certification and assessment in the subject field “Technology,” including the Basic State Exam (possibly, along the model of the Unified State Exam, portfolios, olympiads of the National Technology Initiative, and the WorldSkills demonstration exam); creating mechanisms for counting certification results in the subject field “Technology” as credits in major subjects if the student enrolls in a technology major at the university.

7) Organizing technology competitions for high-school students in a new format (in accordance with contemporary standards for technology problems, technological instruments, and the problem-solving environment).

In tertiary and continuing education:

1) Creating a network of rapid training centers (colleges) in high technology that offer intensive experimental secondary vocational study programs with shorter study duration to assure the more rapid entry of young people onto the labor market in modern specializations involving digital technologies.

2) Creating, testing and introducing modern digital simulator hardware systems and the corresponding teaching aids for inculcating practical skills in 1,000 priority qualifications. Providing opportunities for the digital assimilation of a broad set of technologies and qualifications at each college (at least 300 colleges, including at least 75 colleges offering hands-on training).

3) Creating a system of combined secondary vocational and tertiary education: transforming 30% of secondary vocational programs into applied bachelor’s programs and 30% into short training programs inculcating specific qualifications at rapid training centers, as well as transforming 20% of tertiary vocational programs into applied bachelor’s programs. The applied vocational study programs shall

- prepare students for postindustrial jobs (taking into account the changing qualification requirements for workers, the integrated nature of vocational knowledge, and the high role of IT);

- train workers and technologists on mixed project teams led by highly qualified specialists (designers, constructors, testers);
- offer mixed study programs combining high academic course loads with a practical orientation and the assimilation of manual and technical skills required for the operation of complex machinery;
- offer interactive forms of study (involving the use of simulators, case studies, project activities, etc.) accounting for at least 50% of study hours; and
- have financing and equipment standards at the level of research universities.

4) Updating lists and classifiers of secondary vocational and tertiary study programs in order to assure the continuity of secondary vocational and tertiary education, the flexibility and diversity of study trajectories, and their conformity to the qualification requirements for workers in the high-tech economic sector.

5) Offering teacher training programs at the bachelor's level (double-major programs) and in continuing education; allocating competitive grants for study at regional technical universities for teachers, students and workers of local companies in order to prepare them to teach the new technology courses at schools; providing supplementary resources to general secondary and extracurricular organizations to cover the salaries of coordinators and teaching counsellors monitoring the introduction of the new technology courses.

6) Developing study programs, curricula, practical training and internship programs, and assessment instruments on the basis of professional standards (in particular, corporate standards) and selecting and training management teams for these programs.

7) Enhancing cooperation between employers and the vocational education system for training specialists and workers by

- developing dual training, mentorship, apprenticeship, and company-financed study ("target admissions");

- making secondary vocational students participate in the system of assessing professional qualifications on the basis of professional standards (at qualification assessment centers established by sectoral professional qualification councils of the Russian Union of Industrialists and Entrepreneurs) and WorldSkills standards and in the expert assessment of sample activities recorded in digital development trajectories; and
- employing concessions and the organizational and financial mechanisms of public-private partnerships in secondary vocational and tertiary education.

C. Results in the area “New Technology Education in General and Vocational Schools” by 2030

Immediate results and direct quantitative indicators of their attainment by 2030:

- 1) Russia ranks among the world’s top-10 countries in student scores on international technology literacy surveys.
- 2) Graduates of rapid training centers get high scores on performance demonstration qualification exams (including exams based on the WorldSkills methodology) or undergo independent evaluations (certifications) of their qualifications.
- 3) Growing number of upper secondary school students (9th–11th grades) and vocational college students participate in paid labor activities.
- 4) School students get acquainted with contemporary technologies and acquire practical skills with the help of modern simulator systems with the corresponding digital software and teaching instruments. This will motivate strong school students to choose secondary vocational and applied bachelor’s programs.
- 5) General and extracurricular education programs in the field of technology have been introduced and provided with the necessary material, human and information resources.
- 6) The content of the subject areas “Mathematics and Informatics” and “Science” has been brought up to date.

7) Growing number of students completing primary, lower and general upper secondary education who want to pursue careers in the fields of their technology majors.

8) 100% of students in secondary vocational programs are able to improve practical skills in their majors with the help of modern digital simulator systems. This will speed up the introduction of state-of-the-art technologies and raise the professional qualifications of graduates of secondary vocational programs and the demand for them on the labor market.

9) Increasing salary bonuses for secondary vocational degrees.

Mediated economic effects:

1) growing supply of workers with the general and professional competencies required for jobs in the innovative sector of the economy

2) decreasing burden on Russian regions for financing the professional component of secondary vocational and tertiary study programs

3) growing employer co-financing of programs preparing workers for high-tech professions and fields

Other mediated effects:

1) growing prestige of engineering and technical professions

2) continuous improvement of human resources for Russia's technological breakthrough

2.1.6. Developing and Supporting Talent

A. Description of the problem

The difficulties experienced by Russian schools in supporting motivation and identifying and developing talents are confirmed by international studies: the share of 15-year-olds with high PISA functional literacy scores is substantially lower in Russia than in leading countries.

At the same time, in a number of areas, the Russian system of developing, identifying and supporting talents is justly considered to

be effective and even among the best in the world. Since the launch of the priority national project (2006), talent target support measures (prizes, grants) have been expanding at the federal and regional levels: the National Coordinating Council for Supporting Russian Young Talents has been established, and the Talent Development Conception along with measures for implementing it has been adopted.

In recent years, large-scale projects for supporting the participation of motivated schoolchildren in creative technical and research activities have been launched by the state (Youth Innovation Centers, Quantoriums, competitions of the National Technology Initiative) and private charity organizations (“Sirius” by the Talents and Success Foundation and “Elevator to the Future” by AFK Sistema).

At the same time, the existing system is limited both in its coverage and in its range of fields. It includes only three areas: academic subjects (mostly from the core school curriculum), traditional forms of art, and sport. In all, it covers only 7% of children, and the corresponding professions account for at most 4% of the labor market. The following areas are not covered by the talent development system: technology, modern creative industries, fields of science that are not on the school curriculum, social work, entrepreneurship, and leadership, all of which play a key role in accelerating socioeconomic growth. The transition to specialized study programs in upper secondary school has still not been completed.

When working with talented children, one must not forget that a successful professional career often begins in school today. This requires a timely and well-considered choice of major and trajectory of secondary vocational or tertiary education, an in-depth study of courses, the assimilation of competencies in different areas, and the development of industriousness and responsible working skills, often with the help of talent assessment measures.

In view of the expected changes on the labor market, including the disappearance of groups of professions and the emergence

of new ones, approaches to the choice of profession and to specialized and pre-professional study must change, too. Such study tracks must be designed flexibly and “non-linearly,” take student preferences into account, and, if possible, include courses from different subject areas. They should be open to change based on an experimental determination of the child’s interests and possibilities and labor market trends.

It is important to teach schoolchildren to make choices, to adapt to labor market changes, and to act proactively and take the initiative in order to transform their environment (and, in so doing, develop the qualities of “Human Capital 2.0” — see Chapter 1).

The current Federal State Education Standards for high school call for providing a large choice of courses and specializations, including applied technology areas. However, the implementation of these standards has been hindered by human resource and structural limitations at schools. Despite the existence of positive precedents (specialized study tracks in partnership with companies at the Siberian Federal University; pre-universities in Moscow), only a half of Russian high-school students participate in specialized study tracks. Furthermore, the participation of high-school students in specialized study tracks and pre-professional training is significantly lower in Russia than the OECD average.

All effective foreign models of professional orientation activities have long-term duration and include continual surveillance, monitoring and accompaniment of children over their entire period of study — in particular, with the help of portfolios (digital portfolios in recent years).

Instruments for monitoring and designing individual learning trajectories are still rare in Russia. Today, only 1% of schoolchildren follow individual curricula. Legislation permitting the online implementation of study programs has become an important yet insufficient step towards the diffusion of this practice. The mechanism of crediting the results of extracurricular education programs taken

at other education organizations is rarely applied today. The instrument of the traditional portfolio is technologically outdated and does not have a real impact on the important stages of study and professional trajectories — in particular, due to its limited contribution to the final attestation.

Despite the existence of some interesting practices and successful projects (acquiring the first profession in school, children's science parks, agroschools, etc.), a contemporary system of career orientation (including aptitude and inclination tests, introduction to professions and labor market trends, inculcation of career selection and development skills, professional tryouts, etc.) and of support for the participation of school students in labor and business activities has not been put in place in schools on a large scale.

The goals of a career orientation system are, on the one hand, to introduce students to the broad range of existing professional activities and jobs and, on the other, to promote the professions that will most likely play a major role in the country's social and economic development in upcoming decades, both at the global level (priorities of technological development) and locally (specializations of local labor markets). Contemporary pre-professional education should involve children and youth in manufacturing, business and productive social practices already in school.

A good solution in this situation is to organize career orientation and professional training with the help of the resources of extracurricular education organizations and companies, including the recruitment of successful professionals to work with children and the involvement of universities and colleges in the implementation of study programs for 10th and 11th-grade students (in particular, by having college and university students serve as mentors). Instruments supporting innovative and entrepreneurial activities that have been only used in tertiary education so far (accelerators, business incubators, etc.) should be adapted for high-school students.

Shortcomings in the system of talent support and development for school students lowers the quality of secondary vocational and tertiary education. With only a few exceptions (medicine, economics, law, and military science), theoretical and practical fields that are not taught in school do not get strong and motivated students at the university. This creates problems for engineering, technical, agricultural, transport and service fields of study, which prepare specialists for over 80% of the labor market.

This situation is aggravated by the lack of mechanisms for supporting the development of talented children and young people during the transition from one level of education to the next. There is no system for retaining talents in the country after school or university, either. At the same time, the “loss” of talents is particularly painful at this stage: while public investments into the education of an individual aged 20–22 years are already quite high, they yield no returns for the state or even work to its detriment, as the person leaves to realize his or her potential in a competitor country.

B. What should be done in the area “Developing and Supporting Talent” by 2030?

The key goals of this stage include:

- 1) expanding talent development programs to include new academic areas (social sciences, humanities), technologies and applied arts (design, handicrafts, visual media), programming, innovative social practices and leadership;

- 2) increasing the percent of students covered by programs and competitions (in terms of both age and socioeconomic and geographic status) to identify and develop the talents of all children and young people;

- 3) supporting child and youth initiatives, projects, and communities (including Internet and self-organizing communities) in the fields of technical creativity, programming, and social design with the direct integration of the results of these projects into the socio-

economic development of sectors and regions (with the participation of non-education state departments);

4) using the possibilities of digital technologies for personalizing and intensifying talent development practices and the ongoing support of program participants in talent support centers; and

5) recruiting and training mentors from universities, companies, research centers and the creative industry to work with children.

The attainment of these goals calls for

1) allowing students at every school to study any subject at a more advanced level (in particular, in cooperation with universities or in an online format);

2) creating interregional centers along the Sirius model offering 3-week-long mass study programs;

3) expanding the selection of subjects and age range of specialized student competitions and olympiads (in technical, social, creative and entrepreneurial fields);

4) recruiting and training mentors from universities, companies, research centers and the creative industry to work with students at all education levels;

5) allocating grants to research and project communities that involve students in innovative talent development practices;

6) creating a broad network of different platforms for demonstrating talents, displaying and assessing achievements, and presenting and promoting children's and youth initiatives with the possibility of including these achievements and initiatives in positive social practices in local communities or in development programs for regions and sectors with the participation of different state departments and stakeholders (including the use of crowdsourcing and crowdfunding on the Internet);

7) developing the information environment, including the digital analytic support of personalized study trajectories for children and young people based on identified talents and abilities and with the elaboration of recommendations for children, families and teachers;

8) developing the system of career guidance and specialized and vocational training at every upper secondary school in three formats: in schools (in cooperation with extracurricular education organizations, companies and universities), in lyceums associated with universities, and in lyceums associated with applied bachelor's colleges; establishing specialized upper secondary schools (10th and 11th grades) at all leading universities;

9) creating a system of grants to support the development of talented and motivated graduates of education institutions, including scholarships and travel grants to Russian national and regional education centers, support for the transition from one education level to another or to the labor market, and support for entrepreneurial initiatives, social entrepreneurship, and the first years of economic independence (including career consulting, mentorship, coaching and support communities);

10) augmenting the "weight" of subject-specific and pre-professional achievements in tertiary admissions; and

11) student loans on favorable terms with a 50% tuition subsidy for students at leading research universities who pay for study or live away from home (on the condition of an average USE score of 80 points or above or a victory in a specialized olympiad).

Auxiliary measures for implementing the aforementioned steps:

1) introducing minimum financing standards for basic trajectories of specialized and vocational study that would allow the recruitment of teachers (including university professors and practical specialists) and the organization of project activities and company internships;

2) introducing a mechanism to finance the extracurricular study of school subjects, courses and modules (at organizations or in the self-study format);

3) developing contemporary curricula and pre-specialized, specialized and vocational study programs (including online courses) along with teaching and learning aids and creating contemporary

instruments for identifying interests and abilities (including job try-outs);

4) creating a legal framework regulating summer school programs (during one of the summer months at the discretion of the school and the parents) offering career guidance and specialized and vocational training;

5) setting up a territorially distributed open-access infrastructure for different career guidance services with the participation of non-commercial organizations and small and medium businesses (taking the particularities of regional labor markets into account);

6) supporting the introduction of informational, consultative and recommendatory services for students and their parents to help students understand their interests and career possibilities, set education goals, and elaborate and follow personal study trajectories (taking the particularities of regional labor markets into account); and

7) amending laws regulating the labor and entrepreneurial activities of school students (labor conditions, wages, etc.) and creating services for the informational, consultative and financial support of labor and entrepreneurial activities by school students (mentors, digital recruitment platforms, accelerators, business incubators).

C. Results in the area “Developing and Supporting Talent” by 2030

Immediate results and direct quantitative indicators of their attainment by 2030:

1) growing percent of school students getting target support for talent development (including scholarships, grants and travel grants to national and regional children’s centers);

2) growing percent of 10th and 11th grade students studying in specialized lyceum classes at top universities;

3) growing percent of 15-year-old students with top scores on functional literacy tests (on the PISA [OECD] scale);

4) growing percent of participants of talent development programs entering the labor market (or starting a business) in the area in which they got public support for talent development;

5) rising scores of Russian children and young people of all ages on international olympiads, competitions and tournaments in science, art, handicrafts, sports, etc.;

6) 100% coverage of schoolchildren by contemporary career guidance programs, including the support of entrepreneurial initiatives (both in and out of school);

7) lower number of students dropping out of secondary vocational and tertiary programs; and

8) growing percent of students choosing to continue their studies in areas linked to the country's technological development priorities, especially computer science, leading to a higher quality of admissions in these areas.

Mediated economic effects:

1) higher economic growth rate thanks to the expansion of opportunities for self-realization and the commercialization of products and services in the fields of art, sport, handicrafts, social practices, technologies, and entrepreneurship;

2) growing national economic indicators and global impact thanks to the emergence of academic, technological, cultural and sport elites in the country;

3) increasing labor productivity thanks to the growing percent of specialists who enter their fields as a result of career guidance activities in school that enhance motivation to learn professions, leading to better qualifications; and

4) economy of public and household expenditures on secondary vocational and tertiary education thanks to a lower dropout rate and less frequent change of major in the course of study.

Other mediated effects:

1) higher-quality human capital thanks to the early detection and development of talents (abilities) of citizens

2) better adaptive skills of citizens in changing labor market conditions and growing personal satisfaction with one's profession and quality of life

2.1.7. Launching the Continuing Education System

A. Description of the problem

The Presidential Directives of 2012 stipulated that 37% of the working population between the ages of 25 and 65 should attend training and/or retraining programs. However, only 21.7% of this group has attended training programs as of 2017.

The system of independent qualifications assessment has been formally launched: over 300 qualifications assessment centers and 675 testing platforms have been established, and over 24,000 workers have received qualification certificates. However, this figure is insignificant in comparison to the total number of jobs in the country (35 million).

Thus, Russia has one of the world's lowest rates of adult participation in education today: in comparison, the EU average is 40%, while Sweden and other leading countries have indicators above 60%.

Moreover, there is a major regional differentiation in the rate of participation of the working population in continuing education. Whereas 37.8% of the labor force of Sverdlovsk Oblast underwent training in 2017, only 10.2% of the Moscow labor force did the same. Thus, the leading Russian regional economies (such as Moscow) have considerable potential for accelerating development through adult education.

The Soviet sectoral system of retraining institutes and its ideological system of adult education have been dismantled, yet no free-market institutes have taken their place. The reason is the low national per capita income and the lack of reliable "signals of employee quality" on the labor market, especially in sectors with short technological cycles and highly volatile market indicators (e.g., companies

in the extractive and mineral processing industries retrain their personnel more actively than companies engaged in commerce).

In such conditions, neither employees nor employers have incentives to invest their money and time into continuing education.

The introduction of professional standards as basic guidelines for assessing worker qualifications has been a positive step yet has not been sufficiently implemented in practice.

On the one hand, the process of elaboration of professional standards has not always involved the most authoritative expert groups, which has led market leaders to question the standards' adequacy. On the other, professional standards are weakly harmonized with the system of vocational education and the Federal State Education Standards. In particular, the high fragmentation of professional standards is a major problem given the overall goal of preparing students for work in a broad range of career trajectories.

Finally, another weakness of the existing institutional model of continuing education for the working population is the underdevelopment of online components. In particular, the potential of online courses by leading universities is weakly used. In the USA, online courses by such universities as Harvard and Stanford have long become part and parcel of retraining programs for the working population. Macroeconomic indicators show that such a system partly bridges the gaps in school education that exist in this country, according to PISA studies (Americans have much poorer PISA results than Russians, yet their labor productivity is much higher).

In the conditions of the rapid acceleration of change on the markets of technologies and professions, such a lag may well become a major problem for the economic growth of Russia in comparison to other countries and for the investment attractiveness of Russian regions and towns, which continues to be low. It is therefore essential to develop the continuing education market by stimulating both supply and demand while providing quality guarantees and target support for vulnerable groups of the population.

It should be said that Russia is the absolute world leader in the number of students enrolled in distance education programs (and one of the leaders in the relative share of such students). This creates conditions for using the infrastructure and modules of distance education programs for developing advanced training as an element of continuing education. At the same time, the quality of both distant tertiary and continuing education can be greatly increased by using the MOOCs of top universities and by creating and promoting practice-oriented open online courses by different market participants.

The sphere of continuing education has a particularly high potential for attracting private investments. As the experience of Russia and other countries (such as France) shows, every ruble invested by the state into advanced training for employees attracts 5 rubles of investments by other employees and their employers.

B. What should be done in the area “Launching the Continuing Education System” by 2030?

Key measures with respect to the greater part of the working population and students include

- 1) Giving each working-age citizen the opportunity to participate in a retraining or advanced training program (in accordance with the modern requirements of the profession) followed by an objective evaluation of competencies and job placement assistance through “career development certificates” on the conditions of co-financing (for working citizens) or full financing (for non-working citizens) by the state. Retraining, advanced training and the objective evaluation of competencies should be offered by specially authorized (licensed) centers at leading companies and research and education institutions. The state should allocate grants and loans for developing and launching modern retraining, advanced training, and competency evaluation programs. The cost of these services and the amount of co-financing by citizens or employers will depend on the professional field and the competencies in question. By 2025, the

new market of continuing education programs should become fully self-financing.

2) Placing a public order for continuing education programs in high demand that meet the needs of regional economies and that are financed by Russian regional governments; implementation of models of the cross-subsidization of continuing education programs by regions and regional companies.

3) Establishing Adult Education Centers equipped with the latest equipment and learning technologies at multidisciplinary colleges, universities, corporate universities, NCOs and non-educational organizations.

4) Developing competitive and independent infrastructure for certifying qualifications (including micro-degrees) by providing competitive support for sectoral and corporate centers that evaluate (certify) competencies and qualifications.

5) Supporting the work of professional qualification councils on renewing the methodological and organizational framework of professional exams with the mandatory participation of leading enterprises and business education centers; supporting organizations and subsidizing courses preparing for professional exams.

6) Establishing rules and procedures for assessing self-acquired skills and competencies and accounting for them in professional activities and future study trajectories; creating institutes (at vocational colleges, universities, and qualification assessment centers) for assessing and certifying qualifications acquired through self-study and mutual study.

7) Creating a system at universities for monitoring demand on the continuing education market with the active participation of regional enterprises and innovative businesses.

8) Creating and supporting a unified national electronic platform that would serve as a navigator among study programs and job placement services, including distant and part-time jobs for non-working citizens, migrants and retired individuals (“universities

of the third age”), as well as offering self-study and mutual study services.

9) Converting distance education programs into modern Internet services using digital technologies and “unpacking” these programs into separate modules for expanding the selection of continuing education courses.

10) Creating a national program for certifying 21st century skills and the “new literacy” at education and non-education organizations (including companies, qualification assessment centers of the National Qualifications Development Agency, employer unions, and industry associations) and through competitions modelled along the olympiads of the National Technology Initiative, World Junior Skills, etc.

Target measures for supporting risk groups:

1) encouraging non-working retired people, disabled individuals, migrants, unemployed persons and other members of risk groups to participate in retraining and advanced training programs (in particular, in ICT) by providing them with study certificates (on the conditions of co-financing by potential employers and the state); and

2) organizing the study of Russian as a foreign language and early vocational education in countries with high labor migration to Russia (through Rossotrudnichestvo programs).

C. Results of measures in the area “Launching the Continuing Education System” by 2030

Immediate results and direct quantitative indicators of their attainment by 2030:

1) Annual participation of the adult population in formal and continuing professional education programs greatly increases, attaining the OECD average or above.

2) The percent of companies systematically providing training for employees grows.

3) The employment rate increases among 60–72-year-olds.

4) The number of working individuals taking independent competency assessments grows.

Mediated economic effects:

- 1) increasing supply of workers with the key competencies required for contemporary jobs;
- 2) improving investment climate and growth of investment activities of Russian regions;
- 3) growing worker salaries;
- 4) improving standard of living of retired people; growth of their consumption to the level and makeup of the consumption of the working population; improvement of their health and subjective well-being; and
- 5) increasing number of tax payers (thanks to the growing size of the workforce) and falling spending on unemployment benefits due to the decrease in the average duration of unemployment and in the share of the unemployed among the population at large.

Other mediated effects:

declining social tension due to the insertion of migrants and other members of risk groups into the labor force and their cultural adaptation; improving work culture.

2.1.8. Universities as Innovation Centers of Regions and Sectors

A. Description of the problem

Russia is one of the world's leading countries in the tertiary education attainment of the population and in the average duration of formal education. However, the competencies of adults with tertiary degrees do not markedly differ from the competencies of individuals with lower education attainment, which is a unique case for OECD countries (according to the PIAAC study).

The low effectiveness of mass tertiary education is largely due to the existence of universities and programs offering low-quality services that only imitate the study process. Nevertheless, the network of tertiary education organizations shrank by 42.2% between 2013 and 2017, and the network of university branches was reduced and reformatted by over a third. This was accompanied by a decline

of the segment of low-quality tertiary education (according to the Monitoring Study of the Effectiveness of Tertiary Education Organizations).

In the early 2010s, about a third of students admitted to state-funded places in universities were “C” students, and only a fourth were “A” students, while half of the students admitted to fee places were “C” students, and only 10% were “A” students. In 2018, about half of students admitted to state-funded places were “A” students, and only 17% were “C” students; a third of the students admitted to fee places were “C” students, and a fourth were “A” students. However, these measures mostly solved the problem of the quality of the entering student body in universities rather than the low contribution of the universities themselves to the development of human capital.

Rigid and outdated teaching standards make it impossible to design study programs that would meet the needs of employers and society at large. There are no incentives to develop modern horizontal team and project-based forms of interaction between students and professors, which also hinders the recruitment of practical specialists to teach courses. The high number of low-quality full-time and part-time study programs and the involvement of large social strata in them reduce the total effectiveness of public and private investments in the tertiary education system as a whole. The situation is aggravated by the fact that low-quality study programs mostly attract poorly prepared secondary graduates (graduates of vocational colleges and high schools with a USE score of 40–60 in at least one subject) despite the overall improvement in USE scores in recent years. Studying in low-quality tertiary programs increases the lag of these students behind more successful students by the end of the university period, aggravating social inequality, on one hand, and lowering the prestige of higher education in society, on the other.

International experience shows that sustainable economic growth requires the participation of universities in the

technological, socioeconomic and cultural development of regions (USA, Europe, China, Korea, etc.). However, 29 Russian regions do not have universities with an “A” mean USE score of entering students. These universities are unable to initiate new technological solutions or even to attract the best school graduates of their regions. The results of the “I’m a Professional” olympiad point to the major gap in education quality between top and mass universities.

However, the contribution of universities to socioeconomic development is not limited to education services. As international and some Russian experience shows, universities can act as full-fledged economic agents that make a considerable contribution to the GDP.

The key problem of regional universities is the total or partial lack of research and development work by faculty members, the lag behind the frontiers of science and technology, and the weak ties with business. Many courses (including courses for master’s and senior bachelor’s students) are taught by faculty members who do not conduct research or participate in practical activities in the field. Faculty members sometimes teach 4–5 courses in totally different fields simultaneously (thus, it is highly likely that they are not experts in at least some of these fields).

This problem can be partially solved through networking and the broad use of mass open online courses developed by top universities (in particular, in the blended learning format with seminars and exams held in class). Nevertheless, to raise the quality of education at regional universities in a sustainable fashion, one must promote research and project work.

Most universities have no systems for the support and development of entrepreneurial skills and attitudes. On account of the low innovative activity of businesses, the new or already existing innovative infrastructure in regions (including both the material and the financial infrastructure) is rarely used for its intended purpose. At the same time, this infrastructure could be employed for supporting projects by students and alumni of regional universities in order to

encourage the most qualified and ambitious young people to stay in regions and promote their entry onto the labor market and their involvement in the regional economy through the successful experience of implementing their own projects in accordance with the priorities of regional development.

The structure of education, research and development in regional and sectoral universities should be oriented at the future demands of the labor market, which calls for reorienting study programs at high-tech fields and the new service economy. Universities should become platforms for integrating the interests of sectoral institutes and factories, research organizations and regional companies when creating new study programs and learning technologies. In the case of nationally distributed sectors, this role should be played by base sectoral universities and programs.

B. What should be done in the area “Universities as Innovation Centers of Regions and Sectors” by 2030?

Principal measures:

1) Transferring existing regional infrastructure for innovation support (business incubators, business accelerators, innovation parks, science parks, etc.) to universities and supporting the effective use of this infrastructure.

2) Promoting the development of online courses by top universities and expanding the use of blended courses (with in-class seminars and exams) so that they constitute at least a third of tertiary study programs. These courses shall mostly replace courses taught by faculty members who do not engage in research in the corresponding fields. Faculty members supporting online courses shall be included in the “virtual departments” of top Russian universities. Regional universities will use the saved resources to finance research.

3) Allocating competitive public co-financing for the cooperation of base universities with leading regional enterprises and high-tech companies, as well as grant support along the model tested during

the implementation of Russian Government Resolution 218: providing subsidies over 1–3 years for financing integrated sectoral and regional development projects that are mutually implemented by education, research and business organizations; elaborating university development programs with the attraction of interested sectoral institutes, plants, research organizations and regional companies.

4) Designing and launching a grant competition along the “1+3” model entailing the 7-year grants for research and development work by a consortium consisting of a top research center or research university and three regional universities. A laboratory is established at each regional university; its personnel and research policies are shaped by the head organization. Financing is divided on a parity basis between the head and regional consortium members, while the head member is responsible for fostering advanced research groups with globally competitive results at the three regional universities.

5) Creating a program for supporting 100 universities that are leaders in the domain of comprehensive regional economic development programs and a program for supporting 25 universities that are leaders in sectoral development programs (in transport, medicine, agriculture, manufacturing industries, etc.). These universities shall receive financial support for promoting student initiatives in social and high-tech business (in accordance with regional needs), modernizing the education process, recruiting personnel, and creating advanced research and project groups. An important instrument in this process shall be the support of the creation of intra- and inter-university venture funds.

6) Launching a grant program for alumni of university graduate programs and post-docs of leading research centers that accept teaching and research jobs at regional universities. Each grant shall provide 5-year financing for a research project and academic mobility (2 months per year).

7) Creating joint master's and graduate programs between universities and leading companies, investors and innovative startups

in priority areas of science and technology – in particular, in the framework of innovative territorial clusters and industrial parks.

8) Creating consortia consisting of several universities, research organizations and innovative companies for solving specific regional socioeconomic development problems.

9) Expanding the regular financing of universities to promote regional interests (from regional budgets and the budgets of sectoral state programs).

Supplementary measures supporting the implementation of the principal measures:

1) Introducing new formats of joint work between professors and students at universities (and offering the respective retraining courses for university faculty) to help students to acquire skills not only in fields of science and technology but also in fields relating to the introduction and commercialization of technologies and project management.

2) Organizing practical work, applied project activities, internships and academic mobility for faculty and students of regional universities in the framework of network cooperation with Russian research institutes and leading companies.

3) Removing obstacles to the creation of individual study trajectories accounting for individual abilities, attainments and experience (with the active participation of employers in designing these trajectories from the very start of university studies).

4) Promoting distance study by assuring competitive salaries and retraining programs for the personnel involved, with a focus on the effective use of online learning instruments.

5) Creating a sectoral system of external qualification exams and voluntary objective assessments of different competencies of university students and alumni. The voluntary validation of competencies shall be offered after students take courses and modules with the direct involvement of employers in the development of study

courses and programs (in particular, with the help of the continuing education infrastructure).

6) Establishing and supporting well-equipped centers for assessing study quality and education results (the assessment centers shall be equipped with the support of employers); the equipment shall be regularly updated to conform to the latest trends in the economic sectors (in particular, with the help of the continuing education infrastructure).

C. Results of measures in the area “Universities as Innovation Centers of Regions and Sectors” by 2030

Immediate results and direct quantitative indicators of their attainment by 2030:

1) A greater percent of university graduates stay in their regions and implement their own innovative projects with the help of the innovative infrastructure, including financial assistance.

2) 100% of students get the chance to develop their own business projects and get professional support for their implementation.

3) A pool of promising young faculty members is set up at all universities that act as innovation centers of sectors and regions. These young specialists shall participate in joint projects with the country's top universities — in particular, universities providing online course support. This pool shall also include researchers from newly created laboratories and project managers.

4) Growing volume of R&D per student at regional universities and R&D executed for regional clients (companies and organizations located in the same federal district as the university).

5) Tertiary education has a growing impact on careers: the average salaries of university graduates during their first three years of work are equal to or greater than the mean regional wage.

Mediated economic effects:

1) Accelerating the economic growth of regions (especially regions with slower economic growth rates).

2) Attracting citizens to the tertiary education system — in particular, thanks to the increasing use of online courses for continuing education.

3) Falling percent of alumni who change jobs within a year after graduation due to inadequate knowledge of the practical aspects of their chosen sphere of activities.

4) Creation of highly productive jobs and growth of innovative activity in regions. The technological modernization of regional companies will lead to the greater added value of their products.

Other mediated effects:

- 1) growing involvement and satisfaction of students
- 2) increasing social mobility

2.1.9. Basic and Exploratory Research in Tertiary Education, Global Universities and the Russian Academy of Sciences

A. Description of the problem

Today, Russia lags behind other countries in R&D spending. Nevertheless, with the help of supplementary public funding, certain universities have managed to accelerate their targeted development: the number of Russian universities in the world's top 500 has increased from 6 to 11 over five years (2012–2017), according to international rankings. Thanks to the national project “Education,” the development programs for Moscow State University and Saint Petersburg State University, and the 5–100 Program, a significant segment of globally competitive research universities has appeared in Russia in addition to federal research centers and the Russian Academy of Sciences. However, Russian institutions rank among the world's leading universities in only 25% of subject areas today.

In 2012–2017, the number of publications by Russian scholars in academic journals indexed by the Web of Science Core Collection increased from 36,600 to 53,500. Russia's share in the world's total number of publications rose from 2.27 to 2.78%. However, given that the number of world publications has stably risen by 3–6% annually

in 2012–2017, Russia must constantly increase its publication rate in order to maintain its share.

In 2018, the top-100 international subject rankings of QS, THE and ARWU include 6 universities from the 5–100 Program (HSE, ITMO, MISIS, MPhI, MIPT, and NSU), which appear a total of 14 times in these rankings (in 2016: 5 universities with a total of 5 appearances). 5–100 universities expanded the range of areas in which Russia has entered the top-100 world subject rankings: they now include not only natural and mathematical sciences and engineering but also social sciences and humanities.

5–100 universities account for 50% of all Russian publications (including publications by institutes of the Russian Academy of Sciences) in the most highly cited international academic journals. Over 5 years, the number of such publications by 5–100 universities has increased by 2.6 times in science, 3.4 times in engineering, and 7.2 times in the humanities and social sciences. The total number of publications in Scopus by 5–100 universities has increased by a factor of 3.5, amounting to 40% of Scopus publications by Russian public universities. The mean number of publications per 5–100 university surpasses the mean number of publications per public university by a factor of 9.5.

Top universities are making a significant contribution to the growth of investments in R&D. In recent years, 5–100 universities have increased R&D spending by 1.5 times and have attracted a 2.3-fold increase in R&D financing from non-governmental sources. As a result, R&D conducted by 5–100 universities now amounts to 30% of the total R&D by Russian public universities. The mean R&D per 5–100 university is 1.26 billion rubles, which is 9 times higher than the mean R&D of other Russian universities.

Despite the improving performance of top universities, Russia conducts R&D in only 5% of the global frontiers of science and technology. This is 3–4 times less than the indicator of countries with comparable GDPs. Thus, to prevent the lopsided technological

development and dependence of Russia, it is necessary to expand the country's research in advanced fields that are on the international agenda. To increase the contribution of education to economic growth and technological development, one must expand the group of global research universities and focus on incorporating them into international knowledge and technology networks in priority areas.

At the same time, one must speed up the rapid assimilation of innovations from the entire spectrum of advanced R&D. Thanks to their integration into the global agenda, research universities perform several important tasks. They conduct research, in which they involve large groups of students who, even if they do not become researchers, subsequently act as innovators in the economy and society.

The presence of Russian universities in the top 100 or 150 of subject rankings means that they are known to professionals in the field and participate in global knowledge exchange networks. Their faculty members are invited to international seminars and conferences, and their students are admitted to master's and PhD programs of leading international universities. In other words, they promote the transfer of knowledge and technologies into the national economy.

The absence of Russian universities in such global subject rankings as urban studies, transport, agriculture, medicine, biomedicine, etc., leads to a serious risk of Russia's strategic lag in these fields.

Inventions are another area where Russian science should play a growing role. In 2012–2017, the number of patent applications filed by Russians to foreign patent offices grew by 22.3%, amounting to almost 4,700 in 2017.

However, the problem is that most Russian inventors continue to focus exclusively on the domestic market: the share of applications filed by Russians to foreign patent offices in the total number of Russian patent applications did not surpass 16.8% (2017) over this period.

To assure the advanced technological development of all the country's vital areas, it is necessary to deepen the 5–100 Program and considerably expand this segment. This is hindered today by the poor inclusion of our scholars in international knowledge and technology networks in many areas, the lack of long-term international basic research programs, and the weakness of mechanisms for attracting the best researchers from the global market and encouraging talented young people and graduate students to pursue research careers.

Long-term projects assure the sustainability of research programs and research teams all over the world. Leading research institutions and high-prestige universities should be able to select their research areas and projects independently.

To develop sustainably, a modern multifunctional university must have internationally competitive research centers and laboratories linked to globally competitive study programs. At the same time, modern universities are internally unified and open organizations that interact with many different partners to commercialize the results of their R&D work. To improve their position on the global market, Russian universities must not only receive stable public support that is oriented at the attainment of long-term goals but also create mechanisms enabling cooperation with research institutes, corporate structures and leading companies in order to assure Russia's sustainable top positions on global knowledge and technology markets. However, the gap between R&D conducted by universities and by institutes of the Russian Academy of Sciences has still not been bridged today. This means that the intellectual and material resources of these sectors are not being used effectively due to the lack of synergy.

Today, the human capital of the Russian Academy of Sciences is not fully tapped for conducting advanced research and training innovative specialists.

B. What should be done in the area “Basic and Exploratory Research in Tertiary Education, Global Universities and the Russian Academy of Sciences” by 2030?

Principal measures:

1) Gradually expanding the 5–100 program to 50 universities, including universities with potentially strong research centers in each of the country’s key strategic areas.

2) Creating new and supporting existing international research centers and centers of excellence at universities included in the top 100 or top 200 global subject rankings, depending on the field (research is supported in the areas in which universities have high ratings).

3) Creating a state-of-the-art experimental infrastructure in Russia in cooperation with leading research centers to implement major international projects in key research areas such as mega-science facilities, longitudinal panels for sociological studies, and the collection and classification of big data. Creating an open access infrastructure for international scholars: centers of excellence that will, in particular, attract young promising researchers to Russia.

4) Financing long-term programs (5–10 years) for basic exploratory research by top research universities and centers.

5) Expanding the international recruitment of both young and already established researchers with major research results, with 50% of their salaries co-financed by the state. In particular, one should recruit specialists with work experience at top universities in order to supervise development projects.

6) Supporting the creation of modern study programs in cooperation with the world’s top universities.

7) Creating world-class research and education centers through partnerships between research universities and institutes of the Russian Academy of Sciences, including

- implementing joint master’s and graduate programs and giving universities the right to award academic degrees and organize graduate schools;

- introducing two-year research positions for alumni of graduate programs and young faculty members of regional universities; and
- encouraging the joint use of infrastructure and equipment by research universities and institutes of the Russian Academy of Sciences — in particular, at innovative research and technology centers.

8) Implementing a national information resource program for making centralized subscriptions to all major digital libraries and databases and providing free access to them for all Russian researchers.

9) Designing and introducing new mechanisms of student practical work and internships in the framework of network cooperation with Russian research and high-tech organizations and cutting-edge companies.

10) Creating know-how hubs at research universities that will include research subdivisions of companies, independent research institutes, infrastructure for high-tech start-ups, investors and professional service companies (including accounting services, legal assistance, management and marketing consulting, and protection of intellectual property).

11) Radically reducing the red tape that hinders the development of universities.

C. Results of measures in the area “Basic and Exploratory Research in Tertiary Education, Global Universities and the Russian Academy of Sciences” by 2030

Immediate results and direct quantitative indicators of their attainment by 2030:

- 1) greater volume of university R&D and growing per student income from managing the intellectual property of universities;
- 2) greater presence of Russian universities on global markets of knowledge and technologies, including the sustainable presence in the top-100 of most global subject rankings; and

3) creation of centers of excellence (international research centers) in different research fields and attraction of foreign scholars to Russia.

Mediated economic effects:

1) growth of innovative activities, establishment of globally competitive high-tech companies, and creation of highly productive jobs;

2) increasing added value of goods and services (including exported goods and services) thanks to technological modernization and the expansion of high-tech production; and

3) accelerated integration of Russian business into global markets.

Other mediated effects:

growing prestige of Russian research and Russia as a whole in the international arena.

2.1.10. Education Export

A. Description of the problem

Education export can help to attain three connected goals:

- growth of qualified workers in Russia in areas where domestic specialists are lacking (through the recruitment of foreign graduates from Russian universities)
- income from tuition paid by foreign students
- augmentation of Russia's "soft power" by training elites from other countries

However, despite Russia's seeming success in attracting foreign students, these goals are not being met. The number of foreign students in Russian universities grew from 153,000 to 260,000 between the 2010/2011 and 2017/2018 academic years. Russia has become one of the world's leading countries in the number of foreign students, who make up about 4–5% of the student body in Russian colleges and universities. At the same time, less than 1% of Russians get a tertiary education abroad. This formally resembles the situation in

USA and Great Britain, which also win from a “brain gain.” In Russia, foreign students have the right to work during their studies on the same conditions as Russian students. In addition, the number of foreign specialists working as teachers, researchers and analytic experts at Russian universities and research organizations is constantly growing.

However, a closer look at the situation shows that the positive trend in Russia is due to bachelor's programs (over 10% of foreign students), while secondary vocational and upper-level tertiary programs make a negative contribution. Foreigners account for only 5% of graduate students in comparison to over 20% in developed countries. Thus, the inflow of human capital to Russia through education has little impact on two key economic sectors: qualified workers with a secondary vocational degree and young researchers.

Despite its formally well-developed system of exporting secondary vocational and tertiary education, Russia does not get the corresponding revenues. While Australia has the same number of foreign students as Russia, it earns \$18 billion annually (in comparison to less than \$1 billion for Russia). Russia has problems improving the quality and increasing the quantity of foreign students due to the non-optimal makeup of its foreign student body and the lack of flexible financial instruments and incentives for talented foreign master's and graduate students. Another major hindrance is the lack of world-class study and living conditions even at the best universities. Russia was late entering the market of global education products, which creates the risk of the predomination of digital education resources of foreign providers and mass online courses of foreign universities. Russia has relatively good starting positions on the emerging global market of online university education, although this is mostly due to the initiatives of a handful of leading universities.

B. What should be done in the area “Education Export” by 2030?

Principal measures:

1) creating conditions for the mass attraction of strong foreign students who are able to pay for their education by

- introducing contemporary migratory procedures and systems of tutor support for the study trajectories of foreign students from admissions to job placement; offering Russian citizenship to students that successfully complete a graduate program and permanent residence permits to students that complete a master’s program at leading Russian universities;
- launching a system of marketing programs and a network of recruitment agencies, including specialized programs for developing countries whose students are able to pay for their education (in particular, by promoting the umbrella brand of “Russian higher education”); creating and promoting master’s programs in English (as part of combined master’s-graduate study trajectories);

2) special grant programs for attracting talented foreign students to master’s and graduate programs in priority high-technology fields in partnership with Russian high-tech companies and research centers;

3) increasing the share of faculty members and auxiliary staff with a knowledge of English at leading universities to 90% and 50%, respectively;

4) stimulating the creation and development of mass open online courses by Russian universities on global platforms such as Coursera, EdX, etc.;

5) financial and organizational support for the global promotion of Russian education products, including mass exams, study programs, entertaining educational events and services, and platforms;

6) construction of new campuses and modernization of existing campuses of top universities to meet international standards

(development of social, cultural and sports infrastructure; construction and modernization of campus buildings);

7) grants to foreign researchers and research teams (including family living costs) to attract them to international research centers and centers of excellence at top universities;

8) improving security for foreign students studying in Russia (including measures for raising awareness and diffusing constructive and tolerant practices of intercultural communication); and

9) offering student loans on favorable terms for foreign students in Russia (on the condition that they work in the country after completing their studies).

Supplementary measures:

1) harmonizing the Russian system of academic degrees with the system predominating in the rest of the world — in particular, assuring the full equivalency of Candidate of Sciences and PhD degrees, while retaining the Doctor of Sciences degree as a higher level than the PhD (and raising the standards for the Doctor of Sciences degree to bring it in line with the best international practices);

2) introducing a differentiated degree system with both academic degrees and analogies of the MBA, DBA and DPA;

3) harmonizing the nomenclature of academic study fields in Russia with the system recommended by OECD and UNESCO and enlarging academic study fields.

C. Results of measures in the area “Education Export” by 2030

Immediate results and direct quantitative indicators of their attainment by 2030:

1) growing share of education services (including online education) in the aggregate exports of the Russian economy;

2) growing share of foreign students in Russian secondary vocational, master's and graduate programs;

3) growing share of auditors of courses by Russian universities on the principal global online education platforms;

4) top research universities have their own campuses conforming to international standards; and

5) leading regional universities have modern student dormitories with sports grounds and socio-cultural infrastructure within walking distance of classroom buildings.

Mediated economic effects:

1) compensation of shrinking workforce due to the ageing of the population

2) overcoming the personnel shortage in sectors of the labor market that have an insufficient supply of domestic specialists

3) growing non-state revenues of universities

Other mediated effects:

enhancement of Russia's "soft power" in the international arena; improvement of the country's international image; and popularization of Russian research, education and culture in the world.

2.1.11. Contemporary Content of School Education: Literacy, Personal Development and Universal Skills for All

A. Description of the problem

Education models based exclusively on assimilating knowledge have receded into the past: they cannot cope with the new volume of information and, more importantly, are unable to give students the potential of self-realization that enables them to become happy individuals, worthy citizens and successful professionals in the conditions of the growing uncertainty of the Fourth Industrial Revolution. To meet the socioeconomic development challenges of the modern world, education must teach students the "new literacy" (the ability to solve standard everyday problems) as well as inculcating 21st century skills that are essential for effective social and labor activities and personal happiness.

Today's increasingly complicated social, cultural and technical living conditions also call for new competencies. The low average

level of functional literacy stems from the shortage of programs teaching adults the basics of the new literacy in the financial, legal, digital, medical and other spheres. Illiteracy in these areas means that a person is incapable of taking advantage of the new achievements of civilization and the boons of economic growth, including new technologies, means of communication and transport, financial instruments, and mechanisms for protecting his or her own rights.

Twenty-first century skills are social and cross-professional (universal) competencies that simplify the solution of different personal, professional and social problems. As a rule, they include the competencies of cooperation, communication, critical thinking, and creative activity. Particularly important are the competencies of implementing projects, learning, and assimilating new technologies (for more details, see Chapter 1).⁵

Simultaneously, on account of the rapid development of the creative industries, art education (drama, music, design, choir, dance, etc.) is playing a growing role. Learning methods must radically change in this domain, inculcating values and developing communication skills.

However, the goals of teaching the respective skills and attitudes are being weakly attained. The biggest problem is in lower secondary school, where studies show that a rapid increase in the quantity and diversity of the study load leads to a loss of interest in education, lower assiduity, academic failure, and behavioral problems. These negative trends are exacerbated by the predominance of vertical forms of teaching and the disregard of pubertal processes among adolescents.

⁵ “21st century skills” include cooperation, communication, creativity, critical thinking, self-organization, and the ability to learn. The “new literacy” refers to basic behavioral skills in typical life situations arising in changing socioeconomic conditions, including financial, legal, technological, medical, and environmental literacy.

According to Russian and international studies of samples of lower secondary school students, the following negative trends have been observed in recent years:

- In comparison with 2011, the number of fourth and eighth-grade students that like math and science has fallen (TIMSS, 2015).
- Education results of Russian lower secondary school students are rapidly declining (TIMSS, 2007, 2011, 2015).
- Over the period 2006–2015, the index of satisfaction with science classes among Russian schoolchildren has fallen, in contrast to the OECD average (PISA, 2015).
- Pupils' interest in math greatly diminishes between the fifth and the seventh grades (National Study of Education Quality, 2014).

The falling motivation of teenagers is largely linked to the continuing predominance of monotone monodisciplinary forms of learning activities that continue from primary school. In many cases, alternatives to existing schooling (such as entertaining educational platforms and services on the Internet) turn out to be a lot more attractive and interesting. These are very serious considerations in the age of the Internet: the heroes and ideals of teenagers and attractive behavioral models are diffused and controlled by entities that often have no interest in developing civic awareness and positive socialization.

It should be said that the insufficient attractiveness of school for teenagers is a global problem that is found in many developing and developed countries besides Russia.

The existing system of teaching and assessment ignores the acute need of teenagers for recognition and self-assertion. It should be reformed both at the school (class) level (competency-oriented problems, digital badges and portfolios) and through the organization of different competitions and platforms for demonstrating skills in different areas and formats (including the Internet). Opportunities for self-expression and self-presentation should be

expanded by developing new approaches to art and technology education.

It is necessary to develop and introduce modern personal development forms and social practices for the new generation. Personality development helps students to assimilate key competencies, qualities and attitudes that are essential for self-realization, personal happiness, and effective work in all areas (responsibility, self-organization, empathy, initiative, mindfulness, respect for cultural diversity).

One should stress the development of leadership and enterprise, especially for solving social problems, including the social and ecological development of territories and assistance to vulnerable groups of the population.

An essential component of study programs at all levels is social work (including volunteering), which should be taken into account when students pass from one education level to the next. In particular, one should actively develop cooperation between education organizations and commercial and non-commercial social organizations.

The foundation of school education has always been its content, including both curricula and personal development practices such as support for character building, the transmission of positive social values and attitudes, and assistance in the transition to adulthood. All efforts to modernize school infrastructure, increase school financing, and raise the prestige of teaching will have no significant effects for the country so long as the content of education, teaching methods and personal development practices remains archaic and does not meet the demands of the new conditions of individual development and the need to accelerate economic growth and social development.

In most OECD countries and rapidly developing Asian states, the new challenges have been met by radical changes in the curricula of schools, colleges and universities. This has led to the introduction of new compulsory and elective courses that inculcate new essential

skills (“new literacy”) and to in-depth changes in the methods, technologies and content of traditional courses, the introduction of practical and project-based forms of socialization, and the development of civic awareness and patriotism. The model of the “school of age stages,” which takes the age particularities of contemporary schoolchildren into account, is widely applied.

Although this process has been announced in Russia, it is progressing very slowly. Education standards and technologies at all levels are outdated and insufficient for the inculcation of the skills and attitudes required for success in life. For example, art courses, which play a special role in the development of creativity (in the technological domain, among others) and emotional maturity, are not offered after the 7th grade. Social work and project and research activities (in the sense of “learning through experimentation”) account for a critically low share of the curricula in lower and upper secondary education and are not used at all in personal development practices. This gap is not bridged in secondary vocational and tertiary education, where practices for inculcating leadership and creative and entrepreneurial skills are not widespread (in contrast to competing countries). It is necessary not only to introduce new education standards but also to launch the effective modernization of the content of school education, learning methods and practices, and personal development work. To this end, one needs a contemporary science of education that engages in world-class research and development work.

The present area of transformation serves as the foundation and connecting link for other areas, creating a synergetic effect. In particular, it should be implemented together with measures in the areas “School of the Digital Age,” “Contemporary Infrastructure of Children’s Education,” “Equal Education Opportunity and Success for All,” “New Technology Education in General and Vocational Schools,” “Developing and Supporting Talent,” and “Human Resources for Education Development.”

B. What should be done in the area “Contemporary Content of School Education: Literacy, Personal Development and Universal Skills for All” by 2030?

Principal measures:

1) introducing new content into school education:

- developing experimental standards and learning materials at or above the level of the best international practices (with the use of the unique developments of the Russian school system);
- testing these learning materials in a small group of experimental schools;
- evaluating the effectiveness of the new content and drafting a roadmap for its introduction in Russian schools;
- introducing the new practices in all schools with the help of experimental platforms and a new teacher training and retraining system;

2) developing a new competency-oriented system for assessing the results of the inculcation of new literacy and 21st century skills at all levels of education by

- including questions for testing competencies in final state attestations (Basic State Exam, Unified State Exam, independent qualifications assessment system) in all subjects;
- creating a national program for certifying 21st century skills and the new literacy (at education and non-education organizations, including companies and qualifications assessment centers of the National Agency for Qualifications Development, employer unions, sectoral associations, competitions along the model of the olympiads of the National Technology Initiative, World Junior Skills, etc.);
- widely employing contemporary assessment instruments at the class and school levels: formative and summative assessment, mutual assessment, and assessment of group projects;

3) giving lower secondary school students a broad and diverse selection of high-quality extracurricular education programs

(including vacation programs); integrating school study with other forms of acquiring knowledge and experience; and

4) creating opportunities in lower secondary school for social, vocational and sports tryouts and for the involvement of teenagers in civic initiatives aimed at improving the quality of life of other people — peers, older or younger people, individuals with special needs, and people in difficult life circumstances; mass reintroduction of “school self-government” and the involvement of teenagers in decision-making in schools with regard to issues of evaluation, teaching, and the school environment.

These transformations should be introduced gradually through the following stages:

1) developing new content in the modern sector of extracurricular education (in state organizations such as Quatorium science parks and in private organizations such as social NCOs) and in innovative school networks through the support of local projects and initiatives;

2) elaborating and approving interdepartmental standards for learning outcomes with the participation of industry associations and employers;

3) designing (with state support) a system of civic training, including courses, and systems of assessing (certifying) the new literacy of the population — in particular, through public orders for short courses improving the new literacy of the population at public and private education organizations (vocational colleges, universities, and continuing education institutions), libraries, museums and sports clubs;

4) creating grant programs for supporting local projects and initiatives for popularizing knowledge and informal education in mixed-age groups; science parks; public awareness and patriotic projects; and civic museums, including the regional initiatives of the Znaniye Society, the Russian Geographic Society, the Russian Military and Historical Society, etc.; one should accord special attention

to the skill of independently acquiring new competencies (“learning to learn”);

5) designing and implementing flagman master’s programs (3–5 programs at leading teacher training universities) for training and retraining preschool and school teachers with a focus on inculcating new literacy and 21st century skills;

6) training leader teachers who can organize the high-quality inculcation of positive social attitudes, 21st century skills and new literacy in schools;

7) expanding education standards and model programs in different subjects and school curricula, writing textbooks and teacher’s manuals oriented at inculcating positive social attitudes, new literacy and 21st century skills in all subjects, whether in or out of class; creating a contemporary quality assessment system (modernizing the Basic State Exam, Unified State Exam, and national system of competency certification);

8) pilot-testing programs in a group of Russian regions; providing mass retraining for school teachers, administrators and program implementation teams;

9) launching independent monitoring studies in key areas of the new literacy (financial, legal, digital and other areas) and 21st century skills, including a regular independent monitoring study of the quality of human capital with the use of international (PIAAC) instruments for assessing in-demand types of literacy and key competencies of the population (at least once every two years);

10) broad diffusion of modules and courses inculcating new literacy and 21st century skills among the population at large in online and offline formats (with a particular focus on secondary vocational and tertiary students and with special services for senior citizens, migrants, the unemployed and other risk groups) with the participation of healthcare, cultural and sports organizations;

11) creating within the Federal State Education Standards model study programs and non-linear curricula for contemporary teenagers

featuring the “unpacking” of programs and the openness of schools to local communities, business and government;

12) five-year grant competition for designing and implementing integrated (“hybrid,” interdepartmental) study programs for lower secondary and extracurricular education to increase the motivation of teenagers and involve them in learning activities;

13) annual grant competition for designing and implementing projects promoting the participation of teenagers in the improvement of the school environment and the life of the local community (including the use of interdepartmental cooperation);

14) identifying and diffusing the best practices of summer schools for teenagers on the safe management of the risks of adolescence; and

15) grant support for networking projects, including media projects of non-formal and informal education in the humanities and social sciences (history, literature, art, economics) oriented at the development of key competencies and positive and active social attitudes; support for projects of schools, extracurricular education organizations and social NCOs on implementing contemporary personality development practices.

C. Results of measures in the area “Contemporary Content of School Education: Literacy, Personal Development and Universal Skills for All” by 2030

Immediate results and direct quantitative indicators of their attainment by 2030:

1) By 2024, Russia will join the group of countries with the highest PISA functional literacy scores.

2) Percent of school graduates with high proficiency in 21st century skills (according to international surveys) will be at the level of OECD leader countries.

3) 100% involvement of school students in social practices aimed at developing 21st century skills, leadership qualities and civic literacy.

4) Growing involvement of lower secondary school students in extracurricular education programs.

5) Preserving (or increasing) motivation indicators in lower secondary school (in comparison to primary school).

6) Decreasing asocial and antisocial behavior among teenagers.

Mediated economic effects:

1) growing standard of living of the population thanks to the increasing level of financial, legal and digital literacy;

2) increasing innovative and entrepreneurial activity of citizens thanks to the inculcation of creativity and entrepreneurial skills (in particular, in the domain of high-tech business);

3) growing quality of life, including health and the standard of living (thanks to increasing salaries); and

4) shrinking expenditures on unemployment benefits.

Other mediated effects:

1) lower death rate and improved public health thanks to the inculcation of contemporary functional skills

2) increasing social stability thanks to the inculcation of social cooperation skills and informational, legal and civic literacy

2.1.12. Human Resources for Education Development

A. Description of the problem

The key importance of this area stems in part from the fact that the implementation of all the other proposed areas changes the traditional role of school and university teachers. One must not forget that the efficiency of any project in the sphere of education depends on the motivation and competency of those who teach or organize education activities (including the self-study activities of school and university students). For this reason, in each area of development of the education system, one must offer mass retraining courses to help education workers assimilate new competencies as well as providing special support for networking, leadership projects, and innovations and initiatives by school and university teachers and education or-

ganizations. Without the necessary human resources, none of the proposed areas of transformation of Russian education will have the desired effect.

Today, teachers at all levels of education (regardless of their field of specialization) are becoming primarily organizers of study, project and research activities and learning practices, consultants, researchers, project managers, and “navigators” in the educational (and, in particular, digital) environment. Nevertheless, despite considerable improvements in the human resources of the education system, a considerable percent of teachers and administrators still refrain from taking the initiative or participating in advanced training.

This is linked to the formality and underfinancing of advanced training programs and the lack of practical orientation of teacher training programs at colleges and universities.

Today, teachers at all levels of education have major gaps in competencies in key contemporary areas such as working in the digital environment; organizing project, research and social work; teaching students critical thinking skills; working with disabled and physically challenged students, children of migrants, and children with behavioral and learning difficulties; organizing effective communication with partners about education; and continuing education.

Moreover, the incentives for acquiring such competencies are quite weak. The qualification assessment system for school and university teachers gives priority to formal control and extensive paperwork over objective feedback and support while disregarding the potential of professional teacher communities and independent assessments for professional growth.

The assessment of teaching competencies has not been systematized into an objective sectoral and state regulatory framework that would create incentives for professional growth (professional standards stimulating skill development and attracting workers to the profession have been adopted and are successfully functioning in developed countries).

Another problem is that, in the conditions of rapid change in the 21st century, the management of education organizations has become a lot more complicated, requiring administrators to possess comprehensive management skills and leadership abilities. Nevertheless, only 6.5% of Russian school directors receive training in school management before they are appointed to their positions (in contrast to over 60% in Singapore and the USA and about 40% in Canada and England). There is no system of requirements for acting and potential administrators based on professional standards for secondary and tertiary education.

B. What should be done in the area “Human Resources for Education Development” by 2030?

The management teams of all education organizations at all levels of education should undergo retraining and be required to elaborate programs of change for their own organizations and their public defense.

The following measures should be taken:

1) Shifting responsibility for organizing advanced training and retraining and their results to education organizations. To this end, one should develop and introduce professional standards for teachers and administrators and make the salaries of directors of education organizations depend on work results.

2) Introducing compulsory public certification for directors of education organizations during recruitment and contract prolongation.

3) Identifying, supporting and diffusing the best leadership (including corporate management) and teaching practices as system growth points.

4) Developing and introducing the certification of teachers' knowledge of digital resources and technologies and of methodologies for overcoming academic failure, increasing interest and motivation, and inculcating universal skills. This certification can be

conducted either at the end of advanced training courses or on the basis of teacher self-study. Positive certification results should lead to salary bonuses.

5) Transforming the principles and content of the performance-based labor contract: a differentiated approach should be taken to assessing the performance and determining the salary (salary bonus) of teachers depending on their level of qualification, and the effectiveness of their work should be confirmed by an assessment of the individual progress of students. The starting salary levels of teachers should allow them to meet basic middle-class regional demand for food, housing, self-improvement (e.g., training, cultural life), etc.

6) Transforming models of education worker certification to make them more valid, objective, stimulating and direct.

7) Developing and implementing high-tech teacher training programs with practical components.

8) Creating post-degree support systems for young teachers, including internship programs at the best education organizations and leading universities.

9) Allocating grants to physical and legal persons for creating services for high-tech learning and development and for reducing routine work with an orientation at consumers and their objective feedback.

10) Allocating individual and team grants to teachers (physical persons) for introducing high-tech teaching methods for inculcating the new literacy and 21st century skills; these methods must be accompanied by institutional planning (changing school curricula), the digitalization of learning and development, and the creation of scalable products and services.

11) Supporting the creation of electronic education environments for the professional development of teachers and directors of education organizations adapted to different levels of education and equipped with objective progress assessment systems.

12) Implementing high-tech retraining and advanced training programs in the field of teaching technologies and education content.

13) Grant support for professional development communities of teachers and administrators (in each region) aimed at introducing innovations, improving the quality of education, and promoting career growth in the national teacher development system.

14) Allocating grants to legal persons for creating and maintaining professional development communities, organizing conferences, and developing professional teacher and administrator networks for diffusing high-tech methods of inculcating the new literacy and 21st century skills. Private resources may be invested freely, while public resources should be invested exclusively on the basis of co-financing.

15) Programs of teacher internships in the best education organizations and at leading universities.

16) Creating an institutional framework for post-degree support for young teachers (teaching intern programs).

17) Enhancing the practical aspects of teacher training programs by introducing continuing distributed teaching practice with the help of networking mechanisms between education organizations.

18) Creating precedents of moral incentives and the recognition of the value of the teaching profession in society (awards, special signs of merit and recognition, public actions of recognition by non-governmental organizations and authoritative citizens).

C. Results of measures in the area “Human Resources for Education Development” by 2030

Immediate results and direct quantitative indicators of their attainment by 2030:

1) The profession of a teacher becomes one of the most attractive professions for children in the minds of Russian citizens.

2) Growing percent of teachers and directors of education organizations are involved in professional development communities.

3) Administrative teams (at least 4 people) from each education organization at all levels of education attend retraining courses where they elaborate development programs for their own education organizations.

4) Most teachers and directors of education organizations undergo independent certifications of their level and area of competencies in the domain of new teaching skills based on professional standards.

5) 100% of teachers at all levels of education are certified for working with at least one DLTC and for working in the digital education environment (see area 2, “School of the Digital Age”).

6) Increasing percent of teachers use contemporary technologies in education.

7) Increasing percent of teachers use project and research methods in education.

Mediated economic effects:

1) growing average teacher wages (with respect to the average regional wage), including income from developing new education resources recognized by the teacher community and working with children with learning difficulties and gifted children; and

2) growing rate of diffusion of technological innovations in the economy and society (along the trajectories “school teacher – school student – student’s family” and “professor – university student – organization”).

Other mediated effects:

1) growing social satisfaction and professionalism of teachers and education administrators, who constitute one of the biggest and most influential professional groups in Russian society; and

2) improving social self-perception and social status of teachers thanks to more creative work, the exclusion of routine and monotonous elements, and the expansion of the range of professional contacts.

2.2. Financing the Transformation of Russian Education

The 12 priority areas of transformation of Russian education described above require major supplementary resources. There are two principal factors that condition the possibility of making these investments.

First of all, the low rate of economic growth in recent years accompanied by the preservation and even augmentation of government obligations in certain areas (such as healthcare) has led to a profound resource deficit. The state's resources are not expanding, while the need for investments is growing.

Secondly, as we have already mentioned in Section 1.7, the Russian education system continues to experience a chronic shortage of financing (from the standpoint of the percent share in the GDP, which has considerably fallen since 2013). This means that, in the competition for resources, the education system finds itself in a strange situation: every seeming "increase" in financing and the addition of "supplementary" resources into the education system (if it takes place) will, in fact, be a simple return to the minimum level as defined by basic standards (including standards that are set down by law such as, for example, the right to a free education, which cannot always be assured in reality).

This implies the following goals:

- 1) Finding an approach to implementing the proposed transformations that would yield the greatest returns from the limited available resources. In particular, one should use the opportunities provided by modern technologies (this is only possible way of making education spending more effective).

- 2) Attracting the resources of supplementary stakeholders in addition to the state in order to finance education. The problem is the high level of socioeconomic inequality in Russian society (both in

relative and in absolute terms: the Gini index for Russia is about 0.4, which is significantly higher than the indicators of most developed countries⁶).

This has the following implications.

First of all, it is impossible to make use of radical forms of commercialization in order to attract resources from the market in view of the need to protect the interests of high-risk groups: people with disabilities, low socioeconomic status, or a lack of basic competencies.

Secondly, it is important to support the emergence of new markets of education products and services in areas of potentially unfilled demand (in particular, with a view to the role of technologies in the appearance of new markets and of the corresponding demand among social groups).

The current level of financing of the education system in Russia (about 3.6–3.7% of the GDP) is largely insufficient not only to launch development projects but also to support the simple day-to-day operation of the system (including expenditures on education worker salaries).

The minimum annual amount of public financing that would allow launching the effective transformation of the education system is at least 4.4% of the GDP (with a gradual annual increase up until 2024–2026).

The approaches to financing the development of the education system that we present below are based on the assumption that the running public financing of the education system will increase from 3.6–3.7% to at least 4.4% of the GDP. As we show, the increased spending of the proposed education measures will lead to multifold returns — first and foremost, thanks to the contribution of human capital to economic growth.

⁶ <<https://data.worldbank.org/indicator/SI.POV.GINI?locations=RU>>.

2.2.1. Is There Any Alternative to Investing in Digital Technologies?

The digital revolution in education can attain results that would cost, at the very least, several times more to achieve with the help of traditional means (such as increasing the number of teachers, decreasing the number of students in a class/group, purchasing instruments and laboratory equipment, organizing practical work and study trips).

For example, the individualization of learning trajectories for school students with the help of digital technologies and new forms of organizing the study process would cost about 300 billion rubles in 2024 (the potential year of the system's full deployment). One can model the cost of a traditional system that would assure a similar level of individualization and accessibility of study materials through a sharp decrease in the teacher-student ratio to 1:5. However, our estimates show that such changes would cost at least four times as much. A limited yet nevertheless fairly well-developed version of individualized school studies in a non-digital environment exists in several European countries, including Finland. However, these countries spend three times more money per school student than Russia today (at purchasing power parity). It is precisely the high cost of the individualization of education that has led to the growth of education spending. However, individualized education is well worth it, as it has led to the growing quality of human potential and its greater capitalization, including the development of entrepreneurship and creative abilities. Today, new digital technologies make it possible to obtain similar results at a much lower cost.

In vocational education, digital technologies (simulators) allow students to acquire qualifications at a much higher level. While one-time costs for creating such digital complexes are fairly high (about 200 billion rubles for all professions), the support of these complexes will cost about 20 billion rubles annually. If we were to estimate the

price of obtaining similar results with the help of traditional “real” equipment, the initial costs alone would amount to several trillion rubles. Moreover, the rapid development of modern materials and technologies makes the re-equipment of education institutions with real instruments technically and economically meaningless in many cases.

In tertiary education, the principal type of digital technology is mass online courses (including “blended learning,” which combines online and offline formats). Another important tool is digital learning and teaching complexes that model intricate processes and teach the corresponding behavioral skills (using strategy games, among others). Developing and updating such complexes costs about 20–30 billion rubles annually, while their effect is greater by an order of magnitude.

The average wage bonus for tertiary education in Russia is 60%. The average salary of a graduate from an ordinary university is 50,000 rubles a month or 0.6 million rubles a year. The average salary of a graduate of one of the country’s top 25 universities is 75,000 rubles a month or 0.9 million rubles a year. International experience of using online technologies in education and objective figures on the quality of education in many mass universities and on its improvement potential show that the use of new technologies would raise the quality of education and thus the income of each of the annual 500,000 university graduates by 0.15 million rubles on average.

If we go by the above estimates of the wage bonus for graduates of mass universities, the total economic effect (growth of the GDP) of the proposed measures (assuming a roughly 50% share of the wage in the GDP) will amount to 150 billion rubles during the first year, 300 billion rubles during the second, and 1.5 trillion rubles in 10 years (in fixed prices to 2035).

Can one attain a similar effect with the help of the traditional instruments of tertiary education? The alternative to using MOOCs by leading Russian and foreign professors would be to hire in-house

professors that conduct research in their teaching fields. In practice, this would be tantamount to 200,000 new researchers hired by 600 regional universities. This would mean doubling the number of researchers over 6 years. Such a program, including the creation of local research infrastructure and the recruitment of specialists from the global market, would cost the country several trillion rubles.

These estimates show that Russia has no choice today but to invest in digital technologies for developing its education system.

2.2.2. New Economic Instruments in Education

Infrastructural development is one of the costliest elements of modernization. If the required spending is uniformly distributed over six years, it will amount to over 300 billion rubles annually. At the same time, infrastructural renewal should not be put off, as this defers positive effects.

To optimize spending on new material infrastructure, it would be expedient to use public-private partnership mechanisms and concessions. This would bring about positive effects earlier than in the case of direct state financing. Public expenditures would be stretched out over 7–10 years, while annual state spending on infrastructural development would decrease by 2–3 times (depending on the concrete mechanisms) to 100–150 billion rubles annually in 2019–2024.

1. The first model is the simplest: the so-called “infrastructural mortgage.” A commercial investor builds a school and equips it with learning and information infrastructure according to a contract by which the state pays him remuneration over 7–10 years. The new building becomes property of the state. Investors can be private pension funds, private investors, and banks.

2. In the second model, the commercial investor signs a contract for modernizing and annually maintaining infrastructure and providing advanced training for school employees. Such a “package so-

lution” is particularly effective in the case of comprehensive school reconstruction or in the case of a school’s systematic transition to digital learning and teaching complexes. In this case, the main contractor may be the technology manufacturer, while building companies, designers and other technology manufacturers can serve as subcontractors.

3. The third model is the concession agreement. A commercial investor builds or reconstructs a general school building and then supports its operation according to state standards, receiving a subsidy from the appropriate level of government. Today, several projects of “schools of the future” are already being implemented in Russia with the exclusive financing of private investors. However, as international experience shows, such a model may create risks for equal educational opportunity.

The growth of state education spending will lead to improvements in the quality and selection of education services and, as a result, stimulate the **growth of private financing**. As we have already mentioned, the specific nature of education limits the possibilities of its commercialization. Fee payment and even co-payment mechanisms in education run the risk of lowering human capital by limiting access to education resources among children and young people from low-income families and families with low parental education attainment. Such mechanisms undermine social mobility and make a country’s development potentially unsustainable.

At the same time, fee mechanisms have a motivational effect, making students and their parents consider education to be something valuable, work harder to assimilate study programs and show more responsibility in selecting a study trajectory in comparison with “free” education. These mechanisms also lead to the appearance of innovative products in the education system in response to consumer demand.

Today, citizens are much more willing to invest in their own education and the education of their children as well as in school and

university education in general in order to improve its quality. We believe that it would be expedient to develop forms of private financing of education that do not sap social equity. To this end, we propose:

1. Introducing a law allowing inhabitants of cities and other localities to vote directly on the introduction of local taxes and levies for specific education development needs. The raised money can be used for such programs as a city supplement to the regional subsidy in order to increase the per capita financing of schools; the creation of free or subsidized paid extracurricular programs and services for schoolchildren, including summer educational camps; etc.

2. Promoting the creation of support (development) funds for schools and colleges with the financing of alumni and students' parents. An essential principle of such funds is that contributions by students' parents to the fund are completely voluntary and that no pressure of any kind is put on students and their parents to participate. In particular, it is important to make all contributions to the fund anonymous to avoid disclosing information about participants.

3. Regulating existing fee-based education services and programs so as to set aside a certain share of places for students from low-income families and families with low parental education attainment and spread the corresponding expenditures among the remaining students. The percentage of such places can be as high as 20%.

4. Providing student loans with state guarantees at all levels of education. Student loans should also cover living expenses in the amount of the mean regional wage.

5. Introducing the possibility of using the federal subsidy for multi-child families to cover extracurricular, vocational and tertiary education expenses.

2.2.3. Developing the Market of Education Products and Services

The transition to the new education model and the corresponding investments, the development of public-private partnerships and private financing will **promote the development of a new market of education resources and services in Russia and allow Russian companies to enter the global market**. We are referring, first and foremost, to education products and services based on contemporary technologies (EdTech).

The commercial education market is virtually non-existent in Russia today. There are only a few relatively big private providers working in this area. Although major corporations sometimes take an interest in education development and even invest in it, these projects have charitable or marketing rather than commercial aims and are not sustainable. Despite a number of interesting initiatives (for example, projects by the Netology Group and SkyEng, which are ranked by Forbes among the top 20 most expensive Runet companies), the market's scope and volume are still very small in comparison to the education markets of competing countries. Most market players lack the resources for investing in advanced technologies and even in advanced resources and services using existing technologies.

In contrast, this market is actively developing in many other countries (and not just among world leaders). For example, the EdTech market in India amounted to 247 million dollars and catered to 1.6 million users in 2016. Forecasts say that this market will attain 1,960 million dollars and serve 9.6 million users by 2021.

The online education market is particularly important at the global level today. It was estimated at 165 billion dollars in 2015, which accounted for 3% of the total education market. According to Global Market Insights, this sector should develop very rapidly with an annual growth of over 5%, surpassing the mark of \$240 billion by

2023. There are even more optimistic forecasts that say that this figure will already be attained in 2020 thanks to a mean annual growth of 17% (EdTechXGlobal, IBIS Capital).

Half of the world online education market belongs to US companies; Asian (and especially Chinese and Korean) companies come in second. In Asian countries, the consumption and production of online education services are three times higher than the world average.

Today, the school education segment accounts for 57% of the entire global EdTech market. Forecasts say that it will grow by 25–29% annually. In Europe, the development of this segment is linked to the adaption of different solutions to the highly diverse European education market, while in Asia this segment develops through the attraction of new users.

Studies of the Russian online education market show that continuing education, extracurricular education, and tertiary education are the most attractive segments for the implementation of online products. In 2016, the Russian online education market amounted to 20.7 billion rubles or 1.1% of the global market.

The state can contribute to launching this market by making purchases and by creating a totally new legislative framework that would radically expand opportunities for private companies wishing to enter the education market (in particular, by simplifying licensing requirements), while introducing quality control measures and giving clear guarantees of access to fee-based education products and services for disadvantaged students on the principles of target assistance. Such state activities would promote the development of three groups of consumers: state organizations, companies, and citizens.

A key market driving force will be the **demand of the federal government and public and municipal organizations**. To activate this demand, the government needs to adopt a “roadmap” for developing, testing and introducing digital education resources and

services (DERs) that would give market players a clear and unambiguous understanding of

- what DER sectors the state will develop on its own or through contractors;
- what DER sectors the state will develop through public-private partnerships;
- what products and services the state will purchase in a centralized fashion from private providers and make publicly available; what products and services will be purchased by education organizations; and what products and services will be purchased by private consumers;
- what resources (per purchase) the state intends to spend on the development, on the acquisition for testing purposes, and on the definitive acquisition of specific types of DERs, and what will be the contract conditions (including warranty and maintenance terms); and
- what standards (including Federal State Education Standards, sanitary norms and regulations, networking protocols, etc.) must be met by DER providers.

The key organizing principle of a market with high state participation is that the state pays only for the end product. It is essential to exclude all forms of public financing of R&D work in which contractors simply spend public money without delivering effective education resources to schools. The history of education development in Russia is marked by a whole series of such glaring mistakes. Their repetition will publicly discredit this key initiative.

It is essential for the state to create and support a unified digital education platform (UDEP). This will (a) give each DER developer and provider a substantial market segment that has not been *a priori* splintered into pieces, (b) prevent discrimination against “alien” providers, and (c) improve the competitiveness of Russian education on the global market. The UDEP can offer the certified DERs on any conditions from open to paid access.

The market of education resources in Russia is a monopsony: a market with one predominant buyer — the state. At the same time, the state plays market roles at several different levels: federal projects, regional purchases, and individual education institutions. Spreading purchases among municipalities and schools increases competitiveness yet limits the market volume of each product. The overall impact on the market is largely negative at first.

An open, competitive and high-tech market of education products and services **for private consumers** should become one of key means of raising the effectiveness of both state and family spending. The lack of a broad selection of competencies and of reliable systems for certifying them in extracurricular education for children and continuing education for adults is currently discouraging citizens from investing in these areas.

The main market player should be not so much the state as private investors, developers and copyright holders of education products and services. This market should include not only extracurricular and continuing education but also the formal education sector. The key “consumers” on this market would be students, their parents, and employers — the parties that derive the greatest direct benefit from investments in skills, competencies, and knowledge.

The appearance of what concrete products and services depends on the initiative of private market players? It is a question, first and foremost, of products and services that meet the current and future needs of consumers (students, their families, and employers) as well as products and services whose development is problematic in the contemporary Russian education sphere.

This particularly applies to segments of education content and services that do not directly serve to attain key target indicators which count in the formal education track. For example, the private market of products and services for preparing for USE exams is already overcrowded, while the niches of extracurricular education for children (especially for preschool children and primary school

and lower secondary school students) and continuing education for adults are largely vacant. Free market mechanisms of open competition between high-tech education products and services have great potential in the sector of objective assessment.

The development of digital education resources will lead to the emergence of a **market whose clients are companies**. While this market together with education consulting does not surpass a few billion rubles a year today (a few thousand corporate training contracts), the falling cost and growing possibilities of DERs based on strategy and role-playing games and simulators of technologies and production activities can expand it by an order of magnitude to the level of 75–150 billion rubles in 2024 with potential for further growth. This will lead to a considerable increase in the motivation and qualifications of employees in different sectors of the economy over a short period of time. The need for an accelerated transition to new technologies and forms of activity in the economy will assure the sustainable growth of this sector.

Chapter 3

Prospects of Developing Education in the 12 Key Areas Through the Implementation of National Projects

The periods of late 2018 and early 2019 were marked by an active discussion of national projects that had been elaborated in response to Russian Presidential Directive #204 of May 7, 2018. The expert and academic communities and the public at large had good reason for taking an interest in this area. These national projects (each of which includes several federal projects) define the **main vector of socioeconomic development of the Russian Federation until 2024**. Education development is one of the key elements of the national projects. On the one hand, one of these projects (the national project “Education”) directly concerns this area. On the other, a number of other projects (including the national projects “Science,” “Demography,” and “Labor Productivity and Employment”) target problems that are closely related to the education system. The educational aspects of these national projects partly stem from the fact that the success of specialized projects depends on the training of specialists for the development of the corresponding sectors of the economy and social sphere. This means that today human capital is

de facto recognized as a key element of the socioeconomic development of Russia.

In the present chapter, these projects (in particular, the national project “Education”) are analyzed from the standpoint of the key areas of education development identified in Chapter 2. This will give a comprehensive picture of the possible contribution of education to Russian socioeconomic development through the implementation of national projects. At the same time, this analysis will show which key factors and areas of work should be stressed in education transformation (in particular, during the implementation of national projects) in order to have the greatest possible impact on the country’s development.

Moreover, in this chapter we examine in greater detail the contribution of education to socioeconomic development, as the formulation of the national development goals in the Presidential Directive of May 2018 requires showing how national projects will further poverty reduction, economic growth and technological development. Our analysis shows the connection between national development goals and federal education projects and proposes concrete supplementary measures for improving the effectiveness of national projects in the education sphere using the conceptual framework of human capital.

The supplementary measures proposed in the present chapter may seem to be bold demands for additional financing. However, we consider the financing of these measures to be not so much social expenditures as investments that will give returns in the form of faster economic growth and rising per capita income. The total additional financing required by the measures proposed in the present chapter may constitute up to 0.8% of the GDP within five years, which shall raise the share of education spending in the Russian national GDP to the level of competing countries. However, if we express these expenditures in per student terms, they amount to only a few thousand rubles annually.

3.1. Support System for Early Development

The principal ideas of this area are reflected in the measures of the federal project “Support for Families with Children” of the national project “Education” and the federal project “Promoting the Employment of Women: Creating Conditions for Preschool Education for Children up to the Age of 3” of the national project “Demography.”

The federal project “Support for Families with Children” of the national project “Education” entails the creation of a federal web-portal that would provide parents with informational and educational support and psychological, pedagogical, methodical and consultative assistance.

The federal portal should offer:

- 1) information on available psychological, pedagogical, curricular and consultative services;
- 2) information on improving the psychological and pedagogical literacy of parents of children enrolled in education organizations, in particular for assuring the early development of children up to the age of 3; and
- 3) informational and multimedia materials for parents.

Consulting services will be offered through a network of social NCOs, territorial centers of social assistance for families and children, centers of psychological and pedagogical assistance to the population, and other organizations. This federal project shall help to create favorable conditions for the early development of children — in particular, through programs of psychological, pedagogical, curricular and consultative assistance to parents of children that get preschool education at home.

Special attention shall be given to families with children that have special needs. To this end, training programs have already been launched for specialists who will teach parents to use adapted L&D programs. Long-term intensive support shall be offered to such families to help overcome negative child development scenarios and

promote effective correction. It is important for this support to be offered on an interdepartmental basis with public health organizations.

Moreover, national family support projects provide assistance for parents that have guardianship of children left without parental care. This part of the project is also implemented on the principles of interdepartmental cooperation with child protection and foster care organizations. Target support is provided to families that truly need different forms of assistance.

In accordance with Russian law,¹ parents (or legal guardians) that assure their children's preschool education at home have the right to receive curricular, psychological, pedagogical, diagnostic and consulting assistance free of charge — in particular, at preschool organizations and schools with consultative centers. Such assistance is provided by governmental agencies in Russian regions. The problem stems from the fact that, before the federal project “Support of Families with Children” was elaborated, such services had not been included in the Russian National Service Classifier, and so there was no clear definition of the categories of recipients, the criteria of the delivery of these services at public expense, the standards for providers, and their qualification requirements. As a result, no spending norms were set down for the delivery of these services. As a result, these services are offered today either from non-target funds or on a fee basis. For this reason, one must not only stipulate the content of these services and the criteria for including them in regional budgets but also calculate their cost.

Parents of children enrolled in kindergartens may also require assistance, especially in today's rapidly changing world with the appearance of new stress factors of a cultural, social and technological nature, for which adults are often no better prepared than

¹ Letter #08-364 of the Ministry of Education and Science of the Russian Federation of February 22, 2017, “On Organizing the Work of Family Preschool Groups.”

children (for more details, see Chapter 1). For successfully assisting parents, one must determine the content and format of psychological and pedagogical support programs that would be adapted to contemporary families and meet their needs. In this regard, it is necessary to study the needs of parents and develop formats of providing assistance that meet the contemporary challenges of the digital age. Such studies are not envisaged by the federal project, however.

A number of measures aimed at assuring the 100% accessibility of early-age preschool education by 2021 are envisaged by the project “Demography.” These measures include

- creating additional places for children up to the age of 3 in organizations and with individual entrepreneurs providing preschool education in Russian regions:
 - priority implementation of measures of regional programs for creating additional places for children aged 1.5–3 years in the Far Eastern and North Caucasian Federal Districts
 - creating at least 255,000 additional places in 2019–2021, including places adapted to disabled and physically challenged children;
- support for the non-governmental education sector (in particular, with the use of public-private partnerships) for assuring its effective operation in Russian regions:
 - providing L&D equipment for new places for children aged 1.5–3 years in non-governmental organizations and with individual entrepreneurs;
- raising the qualifications of education administrators as well as specialists and directors of private organizations and individual entrepreneurs:
 - organizing in 2020–2024 advanced training for at least 5,000 education administrators in Russian regions and municipalities as well as specialists and directors of private organizations and individual entrepreneurs; and

- creating preschool care and education groups in the non-governmental sector of preschool education:
creating in 2020–2024 at least 8,600 preschool care and education groups in the non-governmental sector of preschool education.

In its present form, the federal project “Support for Families with Children” aims to provide assistance to families with young children yet does not include diagnostic measures and assistance for the children themselves. The project chiefly focuses on assisting families and creating places in kindergartens for young children. This is not sufficient, however, for the full-fledged operation of a system of psychological and pedagogical care that would assure the best possible conditions for the development of children and the preservation of human potential. Such a system should function at the interdepartmental level with the participation of the education, public health, sport, child protection and foster care systems.

If resources are not available for the full-fledged mass implementation of the project, one should launch a high-quality pilot project that would then be diffused on a large scale after 2024. This means that the national project “Education” should include measures for gathering and analyzing practices, conducting experiments, and developing models on the basis of these experiments. During the pilot phase, one should integrate the results of the project on support for families with the results of the project “Demography,” which aims to improve the accessibility of preschool education for children up to the age of 3 (in particular, by promoting flexible forms of preschool care and education through the development of the non-governmental sector).

If additional resources are found, one can implement a number of other priority measures whose impact will be felt by every family with children yet which are not included in the projects “Education” and “Demography”:

- **Special support for families with children between the ages of 3 and 6 that experience developmental difficulties.** The

special support shall include consultations based on the professional monitoring of children's development, the early diagnosis of their developmental traits and problems, and the elaboration and support of individual trajectories for overcoming developmental problems and their possible correction (in particular, by mobilizing and supporting parental participation).

- **Creating an early care service for physical, psychological and social development for all children aged 0–3 (and for physically challenged children aged 0–6)** offering regular consultations for families with specialists on child development. Today, such a system is envisaged by the national project “Education,” yet virtually no resources have been allocated for it. Given the budget deficits in regions, it is unlikely that this problem shall be solved in the framework of the respective federal project.

The early care system includes a monthly hour-long visit to each child by a specialist (who shall make 6 visits daily). The system shall include 100% of children with developmental problems between the ages of 3 and 6. To implement this measure, one should introduce additional jobs for specialists working with children aged 3–6.

The proposed additional measures, including the launch and operation of an early care system for all children aged 0–3 and all children with developmental problems aged 3–6, the elaboration and introduction of an electronic management system for the early care system, and the retraining of personnel, shall require approximately 40 billion rubles annually over a period of 6 years.

While these are major investments, the returns from them will be a lot higher in the long term. According to the World Bank (2017),² the returns from every dollar invested in early development can amount to \$6–17. No other social investment gives such returns.

In view of today's negative demographic trends, the greatest possible realization of the potential of each child becomes an essential

² Early Childhood Development. World Bank, 2017. <<https://www.world-bank.org/en/topic/earlychildhooddevelopment>>.

condition for attaining national goals in social development and economics. Accelerating the creation of a mass psychological and pedagogical care system for preschool children would serve as a key mechanism for attaining such national goals as halving the poverty rate, increasing the real per capita incomes, and assuring the sustainable natural growth of the population of the Russian Federation.

3.2. School of the Digital Age

Countries and corporations that are leaders in the innovative economy have already attained impressive development indicators with the help of digital technologies. The contribution of digital technologies to the economy of resources, the qualitative improvement of traditional services, the appearance of new services, and the development of goods and services is clear both to professionals and the public at large.

Nevertheless, strange though it may seem, this process is not clear for schools. In the content and technologies of study and administration, schools are still stranded in the past. It is important to note that digital technologies and solutions cannot be directly transferred from life to school. Teachers and education administrators must develop and test these solutions themselves, making a contribution of their own to the creation of a *new* school — the school of the digital age.

The lack of comprehensive support for the *mass* transformation of learning, development and vocational training processes and for new management models and principles runs the risk of fragmentary changes in the education system, increasing the gap between top and ordinary schools.

The federal projects “Digital Learning Environment” and “Teacher of the Future” of the national project “Education” contain important measures for developing the digital environment yet are insufficient for the in-depth digital transformation of schooling.

In particular, the federal project “Teacher of the Future” contains measures on retraining teachers, including the use of contemporary digital technologies. However, international experience shows that retraining is insufficient for digital transformation — it is also necessary to support and inculcate the new practices.

The federal projects “Digital Learning Environment” and “Personnel for the Digital Economy” (part of the national project “Digital Economy”) call for the design and introduction of a federal information service platform for the digital learning environment and a set of model information solutions; the design, testing and introduction of digital learning and teaching complexes in mathematics, informatics, and technology; and the use of the advantages of key digital technologies such as artificial intelligence, blockchain, virtual and augmented reality, and testing and introducing digital simulators and games.

While these areas of digitalization of the education system are very important, the scope of investments and transformations included in the current programs are insufficient for bringing education to a new level of quality. In particular, the federal project “Personnel for the Digital Economy” entails the creation of digital learning and teaching complexes only in three subjects/fields (mathematics, informatics, and technology), which cannot attain the goal of the comprehensive modernization of Russian schooling. In addition, digital simulators and games will be introduced to only a limited extent and so will not be accessible to all school students. A particular problem is the availability of digital instruments and products to children living in small towns and rural areas. The approved programs are more likely to increase digital inequality in Russian education rather than to overcome it.

In addition, these projects do not contain a system of measures for transforming the study process in order to assure an individual approach to each student and the accessibility of state-of-the-art technological solutions in all school subjects, irrespective of a school’s status and location.

For this reason, it is essential to take a series of measures that would allow Russia to become a leader not only in the accessibility of the Internet and computers but also in the use of digital technologies for improving the quality of school education. These measures include:

1. Supporting the mass use of digital learning and teaching complexes (DLTCs) that would partially or totally replace traditional textbooks in all core school subjects.

To assure the effective use of these complexes, one must create, regularly update and promote cloud education resources for school students, parents and teachers (databases, video materials, educational games, digital simulators, online tests, and lesson plans). For the real digital transformation of schooling, one must introduce DLTCs in at least 14 core subjects, gradually set up learning management systems, and digitalize about 40 extracurricular and specialized subjects. To support information systems and digital resources in schools, IT specialist (content manager) positions should be created in schools at a rate of one IT specialist per 500 school students. Otherwise, it will be impossible to restructure the working processes of schools, especially in the domain of updating management and teacher support systems.

To implement this measure, one should competitively select DLTC platforms for two-year study programs in two subjects of the school curriculum that will then be experimentally developed with grants allocated to participating schools. One will then select up to three platforms on which DLTCs in 14 core school subjects and 40 specialized school subjects would be developed in successive years. The state should receive the rights to the unlimited use of the DLTCs in any number of schools and for any number of pupils. A pilot experimental program shall then be held for testing the platforms in 1,000 schools. A competition on the basis of the results of DLTC testing in a specially selected group of 1,000 schools shall lead to the compilation of a list of the best recommended DLTCs for mass use in schools.

It is important that the mass introduction of DLTCs involve not only the purchase of products but also the selection of providers that will support DLTC use in schools, including technical product support (call centers, user forums, teacher training and certification, and content updates for education resources, in particular by the teachers themselves). The estimated cost of DLTC support per school will amount to 50–100 thousand rubles annually for core education courses and 10–25 thousand rubles annually for specialized (short) courses.

Given that all school students will use the digital resources, the annual operating expenditures will amount to 1,500 rubles per pupil on average. Thus, the support and renewal of digital resources may be funded by increasing the financing per pupil by less than 2%.

2. Involving 100% of schoolchildren in personalized study processes with the help of modern simulator games, cloud resources and objective assessment formats

One should create and support the market and entire industry of digital education, including educational games; develop and test contemporary learning models and methodologies involving digital solutions based on artificial intelligence and digital knowledge and competency assessment; and modernize the final and ongoing attestation of students.

In particular, the introduction of 1,000 simulators for pupils of primary, lower secondary and upper secondary schools to enable the advanced study of subjects in an accessible format will require 20 billion rubles (for developing, pilot testing, and purchasing exclusive rights).

3. The development and introduction of online education in rural schools and schools in remote and scarcely populated areas will make it possible to retain or reopen at least 5,000 schools

Mass open online courses (MOOCs) and online education in general can greatly help to overcome the teacher shortage and improve

the quality of teaching and learning materials in rural schools and schools in remote and scarcely populated areas. Online education can help not only to preserve rural schools but also to make high-quality education much more accessible. Of course, this will require reforming curricular programs and school teaching and changing the management of the L&D process. The state will need to purchase and support 200 MOOCs in specialized subjects for the 8th–11th grades (50 courses for each grade) at an annual cost of about 0.45 billion rubles per year over the first 5 years (given a cost of 5 million rubles for developing a single course with interactive and ludic elements and 1 million rubles for annually updating it).

4. Supporting R&D on the effectiveness and impact of school digitalization.

Despite the evident advantages of school digitalization, it is very difficult to measure the impact of the development of new solutions and the diffusion of already existing solutions. Only constant R&D on the digital transformation of schooling can show just how one should proceed in the conditions of a rapidly changing environment and a high rate of technological modernization. The digitalization of Russian schooling will be impossible without research and advanced development work in this field. Only R&D work based on regular data collection (“digital footprints”) can enable evidence-based school modernization.

* * *

The digitalization of education will yield full-fledged returns if the current agenda of federal projects is supplemented with the aforementioned measures. These measures will enable the personalization of study, improve the system’s operating effectiveness, and ultimately lead to the growth of education results. In the vital process of maximally preserving and developing the human capital of each

Russian citizen (in the conditions of negative demographic trends), there is no alternative to digitalization.

The digitalization of Russian schooling is an essential prerequisite for digitalizing the Russian economy and society as a whole. If new generations do not learn to make productive use of digital technologies as part of their everyday lives, it will be very difficult to attain national goals in the economic and technological spheres (not just by 2024 but also in the longer term). The goals of “accelerating the technological development of the Russian Federation and increasing the number of organizations involved in technological innovations by 50%” and “assuring the accelerated introduction of digital technologies in the economy and social sphere” will be particularly at risk.

Thus, the digitalization of schooling is a vital investment into Russia’s future. The considerable expenditures entailed are not only justified but also have no alternative (other means of attaining comparable effects are more expensive by an order of magnitude — see Section 2.2).

3.3. Contemporary Infrastructure of Children’s Education

It is difficult to overestimate the impact of the material environment on the health and academic performance of schoolchildren. Russian and international education specialists have done a lot of studies in recent years on the effects of the school environment and other factors on the academic performance of schoolchildren. The impact of the material environment is assessed at about 15–20%. Learning formats and their diversity have a comparable influence.

Federal projects include quite a few measures in this area. The creation of a digital infrastructure, the expansion of Internet access, the introduction of new places in education organizations, the purchase of learning equipment, and the development of the material infrastructure of many schools should make a major contribution to

the improvement of the education results of hundreds of thousands of schoolchildren.

The federal project “Modern School” entails the creation of material and technical infrastructure for general school and extracurricular programs in the fields of digital technologies, science, technology and the humanities as well as eliminating study in the third shift. At the same time, it must be said that the national project does not set the goal of doing away with study in the second shift.

The federal project entails creating and diffusing the conception (target model) of the “new school” and studying the best contemporary architectural, engineering and design solutions of Russian and foreign education organizations so as to introduce them on a mass scale. However, no funds have been allocated for such study and diffusion of the best practices.

Federal projects also have no measures for the mass renewal of utility systems and the re-equipment of existing school buildings and rooms. This means that the infrastructure of most schools will lag behind the schools of leading countries.

The project “Success for Every Child” envisages creating places for extracurricular study in different fields — especially in rural schools.

However, the project does not address such problems of infrastructural development as modernizing design and construction mechanisms in accordance with new approaches and conceptions; the specification of financing amounts and mechanisms for the renovation of buildings; and the renewal of sanitary and construction rules and regulations. A high-quality contemporary infrastructure is an essential basis without which even the best study programs will be unable to function and even the highest-paid and best-qualified teachers will not manage to realize their potential. In addition, good infrastructure leads to the high satisfaction and motivation of the schoolchildren themselves. The measures included in the national projects represent a significant step forward yet

will be unable to solve a number of vital problems of infrastructural modernization.

Thus, there remain problems that must be solved to enable the federal projects to have their full impact. The following steps would assure the all-around modernization of the infrastructure of children's education:

1. Providing safe transport for rural schoolchildren to large regional schools

Education organizations must be accessible both by foot and by transportation. In sparsely populated and remote districts, about 70% of families make use of transportation. In recent decades, a nationwide school bus system has been created virtually from scratch. However, the pool of buses is quite outdated already and needs to be renewed. In addition, the bus routes must be constantly revised to optimize both the volume and the logistics of transportation.

There is a big difference between accessibility by foot and by transport, as the latter requires much greater expenditures and risk management. Different solutions of optimizing the location of education organizations are needed in each individual case. Remoteness and population scarcity are major factors in Russia. For this reason, one must continue the program of school bus development launched by the national project "Education" — in particular, for meeting the problem of an outdated bus pool.

Purchasing and repairing 12,500 buses will require 158 billion rubles.

2. Annual creation of places in preschool organizations for children up to the age of 3

The national project "Demography" entails creating 255,000 new places in kindergartens for children up to the age of 3 by 2021, including places adapted for handicapped and physically challenged

children. Nevertheless, this will not meet the total demand for places for children up to the age of 3 (over 300,000 places are needed for children aged 2–3 years alone). This reduces the opportunities for early development and hinders the participation of mothers in labor activities.

The abandonment of these measures will limit the access of children to high-quality education. In addition, the failure to create new places in kindergartens for children up to the age of 3 will prevent tens of thousands of mothers from entering the labor market.

The annual creation of 70,000 new places for children in nursery schools given an estimated cost of 0.5 million rubles per place in 2019 with subsequent indexation will require 38 billion rubles annually on average for a total number of 420,000 new places over 6 years.

The financing of the new places in nursery schools will require approximately 5 billion rubles annually.

3. Modernizing the school environment in accordance with the demands and achievements of contemporary design

To make schools more comfortable and better adapted to new L&D formats, one must do more than simply elaborate recommendations and model solutions for transforming the traditional school environment. It is also important to create the conditions for their implementation (e.g., conducting annual renovation work) by allocating the required financing of up to 5–15 million rubles per school (not including the purchase of new furniture).

* * *

The proposed additional measures can make contemporary infrastructure accessible for all school students without exception, irrespective of their social background and place of residence. These measures will also tap the potential of the school environment to improve the quality of education.

3.4. Equal Educational Opportunity and Success for All

Today, a high-quality national education means that a very small percent of children experience academic failure and that students show good results irrespective of their place of residence, state of health, and socioeconomic status.

Unfortunately, the national project “Education” does not include a comprehensive project or a coherent system of measures aimed at providing equal education opportunity and reducing the risks of academic failure.

Individual measures are included in the federal projects “Modern School,” “Success of Every Child,” and “Young Professionals (Improving the Competitiveness of Vocational Education).” Some measures of the project “Support for Families with Children” of the national project “Education” can also have an indirect impact on preventing academic failure.

In particular, the federal project “Modern School” contains the following measures:

- modernizing the material and technical infrastructure of education organizations exclusively offering *special needs general education programs*
 - developing measures for *preventing and correcting academic problems* among schoolchildren from social risk groups
 - developing and testing a target model of the operation of *psychological services* in general education organizations
- The project “Success for Every Child” entails
- creating accessible places in education organizations of various types for implementing general extracurricular programs in different areas;
 - creating conditions allowing *physically challenged children* to assimilate extracurricular education programs (including the use of distance technologies);

- introducing (into the target model of the development of regional systems of extracurricular education) mechanisms of *target support for certain categories of children, including children in difficult life situations, in order to assure the accessibility of extracurricular education and talent development for children from low-income families*; and
- monitoring the accessibility of extracurricular education for children with different individual needs and developmental traits (including physically challenged children; children living in rural areas; children from families in difficult life situations; and children from low-income families).

Let us take a separate look at the planned measures in the sector of vocational education. As we noted in Chapter 1, one of the main problems of the Russian vocational education system from the standpoint of inequality is the insufficiently strong preparation in core education subjects, which leads to a major shortage of “general human capital” among college graduates in comparison to university graduates. As a rule, colleges attract the least successful ninth-grade graduates with low education results who do not want or are less able to continue to study school subjects. Most of them come from families with low education and social capital. The vocational education system aggravates the education lag of this category of students, as school subjects are taught in colleges to a greatly reduced extent, while teaching methods copy school approaches and do not take the social and psychological traits of this category of young people into account.

The national project envisages taking a series of steps to solve this problem. In particular, the project “Young Professionals (Improving the Competitiveness of Vocational Education)” entails the creation of study programs in core subjects for the secondary vocational education system that take the educational needs of college students into account.

Nevertheless, these measures are not sufficient to solve the major inequality problems described above:

1. An important condition for the success of national policy for assuring equal education opportunity is to take preventive measures at an early stage. The risks of education inequality arise already during the preschool period.

For this reason, it is essential **to give every child of the preschool age the opportunity to take a year-long school preparation program (in a convenient format at the family's choice)**. The year-long preschool study program during the year before the child enters school may be offered in different formats such as part-time study groups and consultations (in particular, for children who do not attend kindergarten) and be implemented with the large-scale participation of non-governmental organizations and licensed individual entrepreneurs. Rather than copying school, this program should develop initiative, creativity, discipline, responsibility, self-organization, and cooperation skills and introduce pupils to the organizational, psychological, and communicative models of school life. At the same time, it should promote the general cognitive development of children. While elements of traditional “schoolwork” such as reading, writing and arithmetic may be addressed in this context, their inculcation should not be a priority goal of preschool education. The main goals are social, cultural and psychological adaption; equalization of starting opportunities; and a soft transition from the preschool to the primary education levels.

Offering year-long school preparation programs for all children aged 6–7 years who do not attend preschool institutions (87,000 children) will cost 6.5 billion rubles annually on average.

2. At the school stage, we propose implementing the following **set of measures aimed at overcoming academic failure and education inequality**:

- introducing statutory mechanisms in the education system for identifying children from families with greater risk of academic

- failure (low socioeconomic status, migrants, etc.) and schools with a high percentage of pupils with such risks;
- introducing monitoring instruments at the territorial and school levels that would enable to identify learning difficulties of schoolchildren at an early stage and take measures to overcome them;
 - diffusing model solutions for organizing personalized study that would help to prevent and correct learning difficulties — in particular, with the help of digital technologies;
 - providing target assistance for the education initiatives of children from low-income families, including free extracurricular classes in school subjects, free extracurricular education, and participation in summer schools and top children’s camps;
 - introducing quotas for children from families with low socioeconomic status in schools specializing in different fields of knowledge, preparatory university departments, talent development centers, and summer study programs;
 - compensating family spending on extracurricular education for children from families with low socioeconomic status (including preparation for school leaving exams in different formats, such as online courses);
 - providing grants to schools with a high percentage of pupils that run the risk of academic failure in order to improve the school infrastructure and create additional positions of social teachers, psychologists, resource teachers, and tutors;
 - allocating grants for attracting qualified teachers to schools with a high percentage of pupils running the risk of academic failure and diffusing in these schools the model of the “full-time school” in which pupils take additional classes in different subjects, get vocational training, and participate in social work;
 - improving the qualifications of teachers working with children with learning and behavioral difficulties, children from migrant families, and physically challenged children; and

- introducing incentives (through performance-based contracts) for teachers working with children with the risk of academic failure.

These measures are quite expensive. For example, financing the target support of children from low-income families (approximately 300,000 children) will cost about 16 billion rubles annually.

The allocation of annual grants to 8,000 schools working in difficult social conditions in order to improve their infrastructure will require 5 million rubles per school or a total of 50 billion rubles annually.

These and other measures may require an extra amount of up to 100 billion rubles annually (in addition to the expenditures already approved for the national project “Education”) in order to set up a comprehensive system for overcoming academic failure and reducing inequality. This is an enormous amount. However, the social and economic effects of such measures, which should result in the radical reduction of academic failure among schoolchildren, should greatly surpass expenditures.

3. In secondary vocational education, it is essential to **develop the system of supporting individual study trajectories** of students with poor academic performance by introducing adaptive study methods and a consulting system that takes the individual particularities of children into account (in particular, by creating the positions of psychologists and tutors that assist in social adaptation and provide support for study trajectories).

4. **Reforming the scholarship system** at universities: student aid scholarships should be awarded to truly needy students and amount to 80% of the regional minimum wage.

* * *

The use of OECD methodology shows that abandoning the project would lead to the continued loss of 15% of Russia’s human capital after 2030 and, correspondingly, about 10% of the country’s GDP (figure based on the combined impact of all proposed measures). It

is a question of hundreds of thousands of children that do not get the necessary support or follow individualized study trajectories in school. In addition to economic considerations, problems of academic failure and inequality are also important from the standpoint of social stability. Unless a full-fledged system of address support for study trajectories at all levels of education is set up, the students dropping out from the system will contribute to the growth of social tension and marginalization.

Thus, unless the problems of inequality and academic failure are met, the national goals of halving the poverty rate and assuring the sustainable growth of real per capita incomes shall not be attained.

3.5. New Technology Education in Schools and Vocational Colleges

The principal measures of this area are included in the federal projects “Modern School,” “Success for Every Child,” “Young Professionals (Improving the Competitiveness of Vocational Education),” and “Digital Learning Environment” of the national project “Education.” In addition, certain measures of the national program “Digital Economy of the Russian Federation” can also have a positive impact on the improvement of technology education in schools and vocational colleges.

In particular:

- The federal project “Modern School” includes measures for renewing the content of model school curricular programs in the field of technology and assuring its assimilation — in particular, at Quantorium children’s science parks that are being created through the project “Success for Every Child”.
- The federal project “Young Professionals (Improving the Competitiveness of Vocational Education)” entails creating rapid vocational education centers providing accelerated vocational study programs in professions and competencies that meet with

current and future demand and that are taught at a level corresponding to the best international standards and practices, including WorldSkills standards. At the same time, 5,000 new workshops shall provide training for workers in the manufacturing sector, IT, construction, transport and logistics, design, service sector, agribusiness, and the social sphere.

- The federal project “Digital Learning Environment” entails creating and testing digital educational simulators (virtual laboratories) and digital educational games for learning mathematics, informatics, and technologies for school and college students.
- In addition, the national program “Digital Economy of the Russian Federation” includes grant support for 1,455 schools, 206 extracurricular education organizations, and 33,000 students with outstanding achievements in the fields of mathematics, informatics and technology.

Thus, major transformations are currently being envisaged. Nevertheless, they have a significant limitation insofar as they accord insufficient attention to overcoming the outdated and ineffective structure of vocational education that weakly corresponds to the demand of the contemporary labor market (for more details, see Chapter 1). So far, no solution has been found to the problem of improving the quality of the vocational preparation of workers and technical specialists in the mass segment of vocational education rather than just at individual colleges. The system of assessing study results has not received much attention, either. In the current version of the project, it is unclear how the infrastructure of technology education in schools shall be modernized and how new standards and programs in subjects relating to the country’s priority scientific and technological development shall be introduced in practice. These limitations shall greatly reduce the effectiveness of the proposed measures in the area of technology education.

The new technology education in schools and colleges is approached separately in these two education systems that are weakly

correlated between themselves. In the conditions of the uneven allocation of financing between education organizations, a good solution may be to develop regional cluster network education systems, including extracurricular education organizations and a federal digital education platform.

In this regard, we propose a series of measures that are not included in national projects yet that can make a significant contribution to solving the problem of technological modernization through education:

1) Creating a new structure of secondary vocational and tertiary education: transforming 30% of secondary vocational programs and 20% of tertiary programs into applied bachelor's programs and 30% of tertiary programs into short training programs inculcating specific qualifications at rapid training centers.

The applied tertiary programs shall have the following features:

- preparation for post-industrial jobs (taking into account the changing qualification requirements for workers, the need for integrated professional knowledge, and the growing role of IT);
- training workers and technical specialists with the help of mixed project teams including highly qualified specialists (designers, developers and testers);
- mixed study programs combining high academic course loads with practical components and the inculcation of manual and technical skills required for the operation of complex machinery;
- interactive study formats (including the use of simulators, case studies, and project work) accounting for at least 50% of study hours; and
- financing norms and equipment requirements for applied tertiary programs at the level of study programs of research universities.

This transformation shall not require any additional state funding and can be implemented within the current per capita financing of secondary vocational and tertiary programs.

2) Introducing new formats for assessing the results of vocational education, including olympiads and subject Basic State Exams and Unified State Exams.

One should introduce different formats of attestation and assessment in the study field of technology, including the Basic State Exam (possibly along the model of the Unified State Exam, student portfolios, the National Technology Initiative olympiad, and the WorldSkills demonstration exam), create mechanisms for crediting the results of attestation in the field of technology as coursework in a major subject for students who choose technology majors at the university, and hold school technology olympiads in a new format. This measure will help to reduce both academic failure and inequality (cf. Section 3.4). The attestation formats (including formats based on the WorldSkills demo exam) should give students the opportunity to acquire professional qualifications.

The annual organization of two demo exams for 450,000 graduates of secondary vocational education programs shall require about 10 billion rubles annually over the period 2019–2024.

3) Creating, testing and introducing contemporary digital simulator hardware systems and the corresponding software and digital teaching instruments (including the use of virtual reality technologies and role-playing computer games) for acquainting students with contemporary technologies and teaching some aspects in depth in secondary schools and for inculcating practical skills in 1,000 priority qualifications in colleges.³ This measure should be implemented with the help of existing technological solutions that are used to train personnel in the transport, power, oil and gas, medical, and computer game industries. At the same time, it will be necessary to develop platforms for introducing already existing content.

³ This will require the creation of opportunities for the digital assimilation of a broad set of technologies and qualifications at each college (at least 300 colleges, including at least 75 colleges offering hands-on training).

Annual updates for the content and technologies of all game simulators for all qualifications will require about 20 billion rubles over 5 years.

Annual expenditures on supporting and updating simulator hardware systems will amount to 2,800 rubles per pupil on average.

Thus, developing, purchasing, supporting and updating simulators and digital software and teaching complexes may be financed by increasing the per capita spending per vocational college student by 1–15% over the first five years and by only 2% afterwards.

4) Creating a unified federal repository of programs and teaching methods for elective technology study modules, including the best practices in the field of technology education.

The system of modules consists of study programs for different subjects in general schools and casts the foundations for the design of individual study trajectories that shall assure the variability of curricula. The unified information space will give students the opportunity to choose between specialized modules. Such a repository of programs and teaching methods can have a considerable impact if it brings together programs and modules from all levels and formats of technology education (general secondary education, vocational secondary education, tertiary education, extracurricular education, Quantorium science parks, interest groups, etc.). This will help to identify and diffuse the best practices of technology education. Such a repository may be placed on a unified digital education platform.

The diffusion of the best practices of technology education will require grant support for 700–1,000 schools during the first 4 years of program implementation. This will cost about 10 billion rubles annually.

5) Creating, testing and diffusing regional cluster network education systems that include general secondary schools, vocational colleges, extracurricular education organizations and network program providers.

* * *

The following four national development goals from the Presidential Directive of May 7, 2018, are directly connected to the modernization of technology education in secondary schools and colleges and thus require the aforementioned additional measures for their implementation:

- accelerating the technological development of the Russian Federation and increasing the number of organizations engaged in technological innovations by 50%;
- assuring the accelerated introduction of digital technologies into the economy and social sphere;
- propelling Russia into the world's top 5 economies and assuring economic growth rates above the world average while preserving macroeconomic stability, including an inflation rate of 4% or less; and
- creating a highly efficient export-oriented sector developing with the help of modern technologies and staffed with highly qualified personnel in the basic sectors of the economy, especially the processing industries and the agribusiness complex.

Technologies are the main competitive edge in the modern economy. The principal driving force of technological development is human capital with the necessary knowledge and skills. Thus, despite the major expenditures required for modernizing the technological environment in schools and colleges, the aforementioned steps are essential if our country wants to be a technological superpower.

3.6. Talent Development and Support

The principal measures of this area are included in the federal projects “Modern School,” “Success for Every Child,” “Digital Education Environment,” and “Young Professionals (Improving the Competitiveness of Vocational Education)” of the national project “Education.” In addition, several measures linked to talent development

and support are included in the national program “Digital Economy of the Russian Federation.”

In particular, the federal project “Modern School” envisages developing and diffusing the practice of mentorship with the help of employers.

The federal project “Success for Every Child” entails

- establishing regional centers for identifying, supporting and developing talents and abilities among children and young people along the Sirius model;
- holding a competition for the organization of summer schools;
- organizing events for designing individual curricula in accordance with the selected professional competencies (professional fields of activity) with the use of the “Ticket to the Future” online information platform;
- recruiting students of extracurricular organizations offering advanced study in general school subjects to participate in different forms of support, mentorship and patronage; and
- monitoring the accessibility of extracurricular education while taking the individual needs and particularities of children of different categories (including talented children) into account.

The federal project “Digital Learning Environment” envisages the possibility of crediting the results of electronic education resources (online courses) implemented by other education organizations and education platforms towards school study as well as creating a list of in-demand online services and platforms that can help to design study trajectories and increase the accessibility of mobile education.

In addition, the national program “Digital Economy of the Russian Federation” shall allocate grants until 2024 to 33,000 students of lower and upper secondary schools that show outstanding abilities in mathematics, informatics, and technologies.

However, in view of the importance of promoting talents for accelerating socioeconomic development, the steps proposed by these

federal projects are insufficient. They focus on school-age children without according attention to the transition between levels of education and the entry onto the labor market (as well as entrepreneurship). In particular, they do not propose clear-cut mechanisms for supporting students wishing to design long-term trajectories to develop their talents. Unless additional measures are included in the national project “Education,” the impact of currently envisaged measures shall be quite small, leading to a 10–20% reduction in returns from human capital (as the most promising individuals will not be able to realize their potential).

For this reason, we propose a series of vital measures for talent development that are not included in the national project “Education”:

- **Developing the system of professional self-determination and specialized and vocational study** in upper secondary classes of each school, including the establishment of lyceums at universities. Co-financing 50% of the cost of organizing specialized lyceum classes at universities for 10% of the entire cohort of upper secondary students or about 142,000 students in regions with low levels of normative general school financing will cost about 5 billion rubles annually.
- **Creating a system of grant support for the development of talented and motivated graduates of education organizations**, including scholarships and travel grants to national and regional education centers and support for the transition to new levels of education, the entry onto the labor market, entrepreneurial initiatives, social entrepreneurship, and the first years of economic independence (including professional consulting, mentorship, coaching, and support communities). This will require supplementary expenditures such as

Providing individual scholarships financed by the state for 19,000 bachelor’s and specialty students with a scholarship amount of up to 50% of the national mean wage and

12,000 master's students with a scholarship amount equal to 100% of the national mean wage. Augmenting the size of the scholarship fund will require 1 billion rubles annually.

- **Increasing the role of specialized and pre-professional achievements in admissions to tertiary education programs and organizing multi-round olympiads and competitions.** Organizing 200 multi-round high-school olympiads and student competitions (in particular, in technical, social, creative and entrepreneurial fields) with an average number of participants of 20,000 students in general school subjects, 10,000 students in specialized school subjects and 5,000 students in university competitions as well as holding training schools and master classes for the winners of olympiad rounds will cost about 1.5 billion rubles annually.
- **Student loans on favorable terms** including subsidies of 50% of tuition for talented students at leading research universities who pay for their education or live outside the family (on the condition of a mean USE score of 80 points or above or victory in a specialized olympiad). The average number of such students will be 50,000 annually. The percent of state co-financing can depend on the number of recipients. This measure will require about 30 billion rubles annually.
- **Starting grants for young professionals compensating the difference between the initial and average wage in the region/sector on the condition that they work in the field of their major and, if necessary, in specific regions or territories.** These 3-year grants will be allocated on a competitive basis to 2–10% of graduates of specialty, master's, graduate and medical internship programs depending on the concrete field of study and the situation on the labor market. This measure will lead to a two-fold increase in the number of participants in talent development programs that enter the labor market (or start their own business) in the field in which they received talent development

support from the state. This program will require 1–1.5 billion rubles annually.

- **Providing subsidies for 100% of the mortgage interest rate for the same group of top young professionals** (based on the results of the first two years of work in the profession). Favorable mortgage rates for 5% of talented graduates of specialty, master's and graduate programs: subsidies of 100% of the interest rate (about 8%) on the average price of an apartment of 10 million rubles over 3 years. Such state subsidies will be awarded to 50,000 people annually on average. This will require about 70 billion rubles annually.

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Talents are the most productive element of human capital. International studies show that, while investments in a nation's overall human capital give returns of about 9% annually on average (which is already a lot higher than any other investment strategy according to the World Bank — for more details, see Chapter 1), investments in talents yield even greater returns. Given the insufficiently high growth rates of the Russian economy, the comprehensive and cross-level support of talents (from early age to the entry onto the labor market) helps to attain several national development goals simultaneously, including

- accelerating the technological development of the Russian Federation and increasing the number of organizations engaged in technological innovations by 50%;
- assuring the accelerated introduction of digital technologies into the economy and social sphere;
- propelling Russia into the world's top 5 economies and assuring economic growth rates above the world average while preserving macroeconomic stability, including an inflation rate of 4% or less; and
- creating a highly efficient export-oriented sector developing with the help of modern technologies and staffed with highly

qualified personnel in the basic sectors of the economy, especially the processing industries and the agribusiness complex.

As a result, the proposed additional expenditures will be compensated in the long term with annual returns of at least 15–30%.

3.7. Launching the Continuing Education System

The main measures in this area are included in the federal project “New Opportunities for All” of the national project “Education.” In particular, the project entails

- creating a continuing education platform and a set of services assisting citizens to learn about and choose study programs and education organizations;
- introducing a system of grants for universities to help them develop contemporary continuing education programs;
- providing advanced training courses for 30,000 specialists (university faculty members, including organizers of the continuing education system, and personnel of employer organizations) to promote the implementation of contemporary continuing education programs; and
- creating opportunities for citizens to study individual subjects (modules) at universities and receive certificates after passing exams.

The expansion of citizen participation in continuing education should also be furthered by the adoption and enforcement of statutes regulating procedures for recognizing the results of self-study, including education at the workplace, and other educational activities for updating professional knowledge and skills and crediting them in secondary vocational and tertiary study programs.

The federal project “Young Professionals (Improving the Competitiveness of Vocational Education)” aims to establish rapid training centers as independent organizations or subdivisions of existing vocational education organizations.

In addition to the national project “Education,” a series of important measures for the continuing education system are included in the national project “Labor Productivity and Promoting Employment.” In particular, the project envisages that “1,800 employees of companies participating in the national project shall take part in international internships by 2025.”

Besides, the national project “Digital Economy” plans to create up to 1 million education services by 2024 in order to help citizens to learn basic digital technology skills.

All these measures are systemic in nature and will undoubtedly give a strong impetus to the development of continuing education in Russia.

Nevertheless, given Russia’s profound lag (by more than a factor of 2) behind competitor countries in the sphere of continuing education (cf. Chapter 1), the problem should be posed in a more global fashion: one needs not only to support advanced training courses but also to **create a new market — the continuing education market — in a fairly short period of time virtually from scratch**. The creation of this market will benefit everyone — both employers (who are interested in increasing their wages) and employees (who strive to improve labor productivity). Despite the important steps described above, the current national projects are unable to launch an effective continuing education market. At the same time, such markets have been created in competitor countries and largely account for their greater economic growth rates stemming from the more rapid renewal and development of human capital. If we leave the current measures as they are, employers will be unable to make full use of high technologies on account of the lack of the necessary skills among their personnel. This will also hinder the development of hi-tech entrepreneurship. Both the quality and the quantity of human capital will suffer: without state support for continuing education programs, the economy will get 10% less workers (who will be

unable to enter the labor market on account of a lack of basic skills), which will create a major problem in view of the acute demographic crisis.

To attain the vital goal of the rapid creation of a contemporary continuing education market in Russia, one must take a series of supplementary measures (not envisaged by the national projects) that will stimulate both supply and demand. These measures include

1) **Creating a system of continuing education certificates** for citizens with a broad choice of professional continuing education programs on the conditions of co-financing by employers and the employees themselves. This measure will help to launch the system of continuing advanced training by integrating the efforts of different stakeholders, which will greatly help to increase the participation of citizens in training and education. For senior citizens, the certificates will be offered on the conditions of 100% financing. The total amount of financing currently envisaged by the national project is far too small to attain the indicators of adult participation in education and training at the level of OECD and EU countries (where these indicators are 2–3 times higher than in Russia).

The number of certificates should grow from 500,000 to 1.5 million over 5 years with a gradual reduction in the volume of state co-financing and total support. This program will require between 20 and 40 billion rubles annually. This measure should launch the market and subsequently encourage citizens to cover the cost of retraining and advanced training courses.

2) **Supporting Independent Qualification Assessment Centers** to help them modernize their infrastructure and methodological and organizational framework for administering professional exams with the mandatory participation of leading companies and business education centers; subsidizing courses preparing citizens

for professional exams (with the participation of professional qualifications councils). An important aspect that is not included in the current national project is the expansion of the range of fields and formats of professional continuing education at universities that would go beyond the traditional subject/module system (including the possibility of creating special education products and the corresponding result assessment systems leading to the delivery of “micro-degrees” for working adults).

Creating 100 competency evaluation centers (2–3 centers in each region on average) will require 3 billion rubles annually over 5 years. These centers should subsequently become self-supporting,

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The proposed supplementary measures are crucial for attaining the bloc of economic and technological national development goals in the Presidential Directive of May 7, 2018. It is more than just a question of the four goals that are targeted by measures for modernizing technology education, talent support, etc. (see, for example, Sections 3.5–3.6). Such goals as “assuring the sustainable growth of the real incomes of citizens and the growth of state pensions at a faster rate than inflation” and “halving the poverty rate in the Russian Federation” cannot be attained without rapid improvements in the continuing education system, either.

Let us cite another key argument. In contrast to most other areas of transformation, measures in the sphere of continuing education will have a very rapid impact that will begin to be felt before 2024 in the form of a real contribution to economic growth. Thus, the contribution of the proposed supplementary measures in this area is particularly valuable not only in the long but also in the medium term. As a result, the required supplementary expenditures are largely justified.

3.8. Universities as Innovation Centers of Regions and Sectors

Some of the measures in this area (albeit not the key ones) are included in the federal project “Young Professionals (Improving the Competitiveness of Vocational Education)” of the national project “Education.” In addition, a number of relevant steps are envisaged by the national project “Science.” On the whole, these projects have set the agenda of supporting regional points of growth with the help of the following mechanisms: (1) improving the productivity of universities in the area of regional and sectoral development, (2) introducing the best teaching practices at regional and sectoral universities thanks to cooperation with top universities, and (3) improving the quality and effectiveness of the learning process by developing and expanding the use of online courses.

In the first area, the project “Young Professionals (Improving the Competitiveness of Vocational Education)” envisages the introduction of a system of indicators for universities preparing specialists for the core sectors of the economy and social sphere, including:

1) Developing (together with partners in the real sector of the economy) adaptive, practice-oriented and flexible tertiary study programs that teach students professional skills meeting the demands of the contemporary labor market, including such aspects as digital economy, entrepreneurship, team and project work, and health protection that would be applicable to their future professional activities.

2) Participation of at least 70% of university faculty in R&D in their fields of teaching and the involvement of students in this research.

3) At least 10% of graduates find work through target (employer-sponsored) education contracts (with the exception of Moscow and Saint Petersburg).

The goal of diffusing and integrating the best educational practices and programs is targeted by the project “Young Professionals” through grant support for the faculty of universities in the top-200 of global subject rankings to promote the development and diffusion of advanced tertiary study programs (for 30 university faculty members). In addition, the national program “Digital Economy of the Russian Federation” envisages the creation of international curricular research centers for diffusing the best teaching practices in math, informatics and digital technologies (including internships and advanced training at top universities for regional faculty).

Access to high-quality study courses in regions and support for their creation are targeted by the federal project “Young Professionals,” including the development of a web-portal with centralized access to online courses offered by different education platforms; the compilation of independent rankings of online courses — in particular, by using the criterion of credits given for these courses by tertiary education organizations; and the competitive selection of universities for developing online courses.

However, a major limitation of measures proposed by this federal project is the insufficient attention paid to the lack of in-house R&D and the lag behind the frontiers of science and technology of many non-elite Russian universities. It also fails to solve the problem of poor personnel development at regional universities, including the acute shortage of administrators. Finally, the project’s design basically ignores the fact that such universities lack internal resources for development. They find themselves caught in the “poverty trap,” from which they are unable to escape.

In such conditions, the economies of Russian regions do not benefit from the driving force of growth in many developed and developing countries: powerful universities that serve as centers of research and innovation for regional businesses and connect regional markets with globally competitive innovations. For this reason, we

propose a number of measures that can play a major role in stimulating the development of research and development at the regional level and that will complement the measures of the national projects “Education” and “Science”:

1) support for the development of research and innovations at non-elite universities through cooperation with top universities

The participation of regions in the priority areas of scientific and technological development that assure Russia’s sustainable presence on global knowledge and technology markets can be promoted by programs supporting globally competitive multifunctional consortia at top universities. Such support should take different forms, including a grant competition along the “1+3” model that entails the 7-year financing of R&D by a consortium consisting of a top research center or university and three regional universities. Each of the regional universities shall set up a laboratory whose personnel and research policies shall be determined by the head university. Financing shall be divided on a parity basis between the head and regional consortium members, while the head partner shall be responsible for creating an advanced research group with globally competitive results at each of the three regional universities.

Joint research by consortia of top and regional universities will require financing in the amount of 4 billion rubles annually.

2) personnel development

It is essential to develop the personnel of regional universities through internships and advanced training at top universities (today, such measures are only envisaged by the national program “Digital Economy of the Russian Federation”: the creation of international curricular research centers for diffusing the best teaching practices in math, informatics and digital technologies) and through a program supporting academic mobility to top universities of post-docs from tertiary education organizations (with the exception of

organizations located in Moscow and Saint Petersburg). Grants should also be provided to graduate students and graduate degree holders. These must be long-term grants, providing 5-year financing for research and academic mobility (2 months annually).

3) transferring existing regional infrastructure for innovation support (business incubators, business accelerators, innovation parks, science parks, etc.) to universities and supporting the effective use of this infrastructure

Today, most universities lack systems for supporting and developing entrepreneurial attitudes and competencies. As a result of low innovative business activity, the innovation infrastructure (whether material or financial) that has been set up or is developing in Russian regions is being employed to only a small extent. The proposed measure will promote the use of innovative infrastructure for supporting projects by students and alumni of regional universities in order to encourage the most qualified and ambitious young people to stay in regions and promote their entry onto the labor market and their involvement in the regional economy through the successful experience of implementing their own projects in the priority areas of regional development and with the support of local businesses interested in getting access to innovative infrastructure.

Grants for universities to support the process of transferring the existing regional innovation infrastructure to universities shall require grants of 25 million rubles to 100 universities annually or a total of 2.5 billion rubles annually over 3 years. This infrastructure should subsequently become self-supporting.

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While national projects (such as the 5–100 Program) pay some attention to top universities, they mostly overlook “second tier” universities, many of which are located in regions in whose development they can play a major role. Today, some regions have no universities

with high USE scores of entering students. The existing universities have very limited opportunities for creating human capital that could subsequently restart regional economies. This is due in part to the fact that Russian tertiary education mostly lacks a mass business aspect today. Nevertheless, the problem also lies in the lack of basic conditions for learning professional skills at many regional universities.

Unless this situation is redressed using the proposed supplementary measures, there is little hope that the following national development goals can be attained:

- accelerating the technological development of the Russian Federation and increasing the number of organizations engaged in technological innovations by 50%;
- assuring the accelerated introduction of digital technologies into the economy and social sphere; and
- propelling Russia into the world's top 5 economies and assuring economic growth rates above the world average while preserving macroeconomic stability, including an inflation rate of 4% or less.

In these circumstances, the maximum proposed supplementary expenditures of 10 billion rubles annually in this area are an acceptable price to pay for the acceleration of regional development.

3.9. Basic and Exploratory Research in Tertiary Education, Global Universities and the Russian Academy of Sciences

The principal measures of this area are included in the national project “Science” and partly in the federal project “Young Professionals (Improving the Competitiveness of Vocational Education)”: steps for creating infrastructure for groundbreaking international research, training research personnel, and promoting the participation of universities in the global market. In particular, the national project “Science” envisages

1) creating advanced infrastructure for R&D and innovation; creating and developing megascience research facilities; modernizing laboratory equipment; and providing access to academic journals, citation databases, and research information and results, including patents and big data, for all research and education organizations;

2) creating world-class research centers, including a network of international mathematics centers and genomic research centers; establishing at least 15 world-class research and education centers by integrating universities and research organizations and organizing their cooperation with organizations in the real sector of the economy; and

3) establishing a unified system of education and professional development for researchers and university professors that would support R&D work by young researchers and the creation of research labs and competitive research teams.

In the area of establishing a system of researcher training, the federal project “Developing Human Resources for Research and Development” aims to increase the number of young researchers working full-time at R&D organizations by 25%. To attain this result, it shall provide

- grant support for research and development projects and research projects in the priority areas of scientific and technological development by graduate students, at least 50% of whom shall be advised by promising young researchers; projects for creating new laboratories, at least 30% of which will be headed by promising young researchers;
- training for managers of R&D projects and laboratories at competency development centers; and
- advanced training for individuals wishing to serve as directors and deputy directors of research and education organizations.

Moreover, the project “Young Professionals (Improving the Competitiveness of Vocational Education)” of the national project “Education” envisages the rotation and competitive selection of universi-

ties receiving state support in order to improve the competitiveness of top international research and education centers.

While national projects recognize the key role of basic and exploratory research as a driving force of technological progress and a major condition of economic growth, they have a number of serious shortcomings. The biggest among them concerns the institutional organization of R&D and its human resourcing: long-term projects by top universities do not get the attention they deserve, while the recruitment of personnel from the international labor market (including Russians working abroad) receives no special support. Without drawing on the potential of top universities and promoting their full-fledged participation in the global research agenda, the proposed measures may have a weak long-term system impact.

For this reason, we propose complementing the national projects “Education” and “Science” with the following measures:

1) financing long-term (5–10 year) basic exploratory research programs by top universities and research centers

All over the world, long-term projects assure the stability of research programs and the effective development of research teams. One must gradually increase the financing of research by top universities engaged in high-quality globally competitive studies until it matches the financing of education in 2030. This will require expenditures of about 29 billion rubles annually. Such programs can bring together universities and institutes of the Russian Academy of Sciences.

2) expanding the international recruitment of leading and/or promising scholars that have already produced significant research results, including state co-financing for their salaries

We propose using a model in which the state reimburses universities 50% of the salaries of globally competitive faculty members that meet certain publishing and citation criteria (at least 1,500 grants

annually) — an approach that has already proven its effectiveness in China. This will require about 25 billion rubles annually.

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Due to the growing demands on the quality of human capital and the rising competition in the domain of R&D in the world today, top universities are becoming the main driving forces of economic growth. Without the support of long-term research programs and the implementation of other proposed supplementary measures for developing top Russian universities, it will be impossible to attain many national development goals, including:

- accelerating the technological development of the Russian Federation and increasing the number of organizations engaged in technological innovations by 50%;
- assuring the accelerated introduction of digital technologies into the economy and social sphere;
- propelling Russia into the world's top 5 economies and assuring economic growth rates above the world average while preserving macroeconomic stability, including an inflation rate of 4% or less; and
- creating a highly efficient export-oriented sector developing with the help of modern technologies and staffed with highly qualified personnel in the basic sectors of the economy, especially the processing industries and the agribusiness complex.

While the proposed measures require an additional spending of about 50 billion rubles annually, these investments will pay off by raising Russia's global competitiveness in the economic and hi-tech domains.

3.10. Education Export

The principal measures of this area are included in the federal project “Education Export” of the national project “Education”:

1) Promoting Russian education abroad — in particular, through a system of summer and winter schools and foreign branches and representative offices of Russian education organizations — in order to attract foreign citizens for tertiary study.

2) Creating resource centers for teaching general school courses in partner countries.

3) Building contemporary multifunctional student villages with comfortable living conditions, classroom and self-study premises, and cultural and recreation events and sports facilities.

4) University courses and modules taught in foreign languages.

5) Reducing administrative barriers to the entry, stay, study and employment of foreign students and faculty members in the Russian Federation. In particular, at least 5% of foreign students that get tertiary degrees from Russian universities in fields which are in high demand today (and experience a shortage of specialists) should find work in Russian companies (including the work abroad format).

6) By 2024, at least 60 universities should each launch at least 5 study programs that get international certification.

Despite the considerable diversity of measures and major investments, the federal project “Education Export” is not sufficiently systematic. Above all, it does not distinguish between three basic groups of foreign students whose attraction requires different approaches, instruments and resources (these three groups may partially intersect). First of all, foreign students may be attracted in order to join the Russian labor force and increase the number of qualified specialists in the Russian economy. Secondly, foreign students may be attracted to fee-based education services to raise the country’s revenues. Thirdly, students may be attracted for improving Russia’s global stance in the framework of its “soft power” strategy.

In addition, the project does not identify the potential points of growth of education export. In most countries, top universities

play a leading role in expanding the export of high-quality tertiary education. About 20% of foreign tertiary students in Russia study at top universities. On average, foreign students account for 12% of the student body of top Russian universities in comparison to 30% internationally. This shows that the number of foreign students enrolled at top Russian universities can be increased by a factor of 3.

Finally, increasing education export requires not only attracting foreign students for study in Russia but also promoting online products that would, in the long run, play a major role in full-time bachelor's and master's programs all over the world. If Russia ignores this market, it will lose revenues from the direct sale of such products as well as losing opportunities for exerting “soft power” and for attracting students to its full-time study programs. If potential applicants get acquainted with high-quality online courses in English of top Russian universities, they will have a much stronger incentive to come to Russia to continue their education and labor trajectories.

To enhance the effectiveness and system impact of the federal project and guarantee the attainment of indicators set down in the Presidential Directive of May 2018, one must take a number of supplementary steps (cf. Sections 3.8, 3.9). In particular, the federal project does not envisage developing and tapping the potential of online technologies for increasing education export.

The supplementary steps in the domain of education export include

- 1) Organizing grant competitions for creating and promoting online products in foreign languages for students of all ages (online courses, online educational games, cloud complexes of mass online courses) on the global platforms Coursera and EdX, among others. This will require about 4 billion rubles annually in 2019–2024. To this end, we recommend amending the federal project “Education

Export” by making the state order for top universities include the development and implementation of online courses in in-demand fields and their promotion on global education platforms (jointly with the federal project “Young Professionals”).

2) Expanding the use of public-private partnerships for attaining education export goals, including the construction of student villages and the attraction of foreign students.

3) Focusing export support measures on universities with high export potential.

4) Developing and offering (together with major employers) study programs preparing specialists for key industries — both for implementing foreign projects and for recruiting qualified specialists for working in Russia.

5) Offering study programs of different duration for talented undergraduate and graduate students from top foreign universities in order to promote the positive image of Russian academia and culture abroad (at least 15,000 participants annually).

6) Allocating grants on a competitive basis for the study of foreign graduate students in Russia (on the conditions of co-financing by the host university) amounting to at least 1.5 of the average regional wage (at least 2,000 new grants annually).

Education export shall play an important role in attaining the national goal of “creating a highly efficient export-oriented sector developing with the help of modern technologies and staffed with highly qualified personnel in the basic sectors of the economy, especially the processing industries and the agribusiness complex.” The small proposed amount of additional spending (up to 6 billion rubles annually) shall greatly increase the visibility of Russian education abroad and help to attain the goals of other areas of transformation of Russian education discussed in the present book.

3.11. Contemporary Content of School Education: Literacy, Personal Development and Universal Skills for All

The principal measures of this area are included in the federal projects “Modern School,” “Success for Every Child,” “Teacher of the Future,” and “Social Work” of the national project “Education.”

The project “Modern School” envisages

- offering general school curricular programs through the Internet in order to improve the access of children to diverse high-quality education;
- updating federal state education standards and model programs for the general school curriculum for the inculcation of basic knowledge, skills and attitudes and the formalization of “*soft skills*;”
- elaborating a methodology for the quality assessment of general education in schools patterned after international studies of the quality of student preparation and conducting the corresponding studies; and
- introducing new forms of teaching and assessing education achievements and results in the *study field of technology*.

The project “Success for Every Child” entails

- providing opportunities to study core general school subjects through individual curricula, including online study, with credits for completing extracurricular general school education programs and vocational education programs; and
- involving students of education organizations providing extracurricular education in general school subjects in different forms of support and mentorship.

The project “Social Work” promotes the development of volunteering. In particular, it envisages

- establishing territorial volunteering centers and support offices at education organizations;

- providing training (retraining) for specialists on volunteering activities and on developing technologies for working with volunteers at volunteering support centers, NCOs, education organizations and other associations working in the domain of volunteering; and
- allocating subsidies (grants) for developing the best practices in the domain of volunteering and supporting citizens that regularly participate in volunteering projects.

As we see, the national project proposes a wide range of measures for modernizing the content and technologies of general education (which, by law, includes personal development). At the same time, these measures are hardly sufficient. They do not answer the main question: how and why will these new goals be adopted by over a million teachers in their everyday work? Of course, one can stake on mass retraining (and even certification) programs for teachers. Nevertheless, the design of the federal projects does not employ the synergy of different retraining measures, harmonize new school standards and teacher training and retraining programs, or develop digital education resources. The transition to the attainment of new learning outcomes and personalized L&D technologies is impossible without the active participation of every teacher and every school. To this end, one must rework study programs and design school development programs. All of this requires incentives, coordination and monitoring.

There are also a few “missing” steps. For example, the projects do not accord sufficient attention to the assessment of education results in the context of education modernization. They include different methods for recording achievements yet do not discuss in detail the basic institutional assessment instruments. Unless the new learning outcomes are reflected in the Basic State Exam and the Unified State Exam (in particular, with the help of digital technologies), the planned measures will have a weak impact on real teaching practices and will not encourage the high motivation of schoolchildren

and their families. The projects also mostly overlook personal development, only considering the support of volunteering. Such an approach is insufficient in view of the complex sociocultural changes taking place today and the necessity of taking an active independent stance in solidarity with other people (for more details, see Chapter 1).

One can conclude that, to attain the two goals of the national project “Education,” one must take supplementary measures to effectuate a real (rather than just formal) transformation of the content of school education. Such measures may include the following:

1) developing and introducing digital instruments (including USE and SFA exams) for the objective evaluation of learning outcomes (including the “new literacy” and meta-subject skills) for teacher and student use

It is necessary to create and introduce objective grading and feedback systems based on digital technologies for all compulsory and elective school subjects, for both ongoing and final assessment. Grant support should be provided to 500 experimental schools over 2 years to fine-tune innovations in this area. In subsequent years, grants should be given to these schools and research teams for diffusing the new practices to all the country’s schools.

It will be also necessary to finance the elaboration and nationwide introduction of learning practices aimed at developing meta-subject skills, including retraining courses for 50,000 curriculum coordinators and head teachers.

2) developing and diffusing learning practices aimed at promoting motivation and independence

As to personal development, the attainment of the second goal of the national project (“developing harmonious and socially responsible individuals with the help of the spiritual and moral values of the ethnic groups of the Russian Federation and historical and ethnic cultural traditions in the existing system”) is not assured in

the current version of the national project. The development of volunteer work is clearly an insufficient measure.

In this regard, it would be apt to introduce contemporary personal development practices at all levels of education (from preschool on) in order to inculcate social skills and communal solidarity for the common good, including

- supporting student self-government initiatives and the establishment of school and university clubs and associations (including online associations);
- implementing national and interregional networking projects in the domain of environmental protection, regional studies, social development, and culture to provide content for a unified education space;
- supporting summer projects and study programs to introduce school students to constructive social work; and
- providing supplementary financing for creating school counselor positions in schools working in a difficult social environment.

To implement these measures, support must be allocated in the form of grants to schools and initiative teams.

* * *

The content of education is the cornerstone of every education system. The proposed supplementary expenditures, which do not exceed 20 billion rubles annually on average, are essential for attaining the goals not only of this area but also of many of the other areas discussed above (including talent development and success for all). Thus, the full-fledged implementation of measures in this sphere casts a foundation for attaining many other national development goals in the domain of the economy as a whole (such as the growth of per capita income) and in the social domain (such as halving the poverty rate). We should also expressly stress the importance of this area for attaining one of the two principal goals of the national project “Education”: “developing harmonious and socially responsible

individuals with the help of the spiritual and moral values of the ethnic groups of the Russian Federation and historical and ethnic cultural traditions in the existing system.”

3.12. Human Resources for Education Development

Some of the principal measures of this area are included in the federal project “Teacher of the Future” of the national project “Education.” In particular, this project entails the retraining and recertification of administrative teams (directors and deputy directors) of education organizations. It also envisages continuing teacher training and new forms of assessment of the professional skills of teachers with the help of digital technologies. The project calls for the establishment of professional associations and programs for exchanging experience and best practices (with the help of internships and other formats). Moreover, it aims to involve employers in continuing professional education and to create support and consultation systems for education workers below the age of 35 during their first three years of work.

Expert discussions in the domain of education are currently focusing on the figure of the teacher. The Presidential Directives of May 2012 affirmed the priority importance of school and university teachers in improving the quality of education in Russia. In this regard, the steps envisaged by the national project are important and well-considered. Nevertheless, they are not sufficiently comprehensive. Almost all of them are “top-bottom,” i.e., they subject teachers to increasing guidance and supervision. The creative and innovative potential of teachers and their communities is not sufficiently taken into account or considered to be a valuable resource. The problem does not simply lie in the fact that, as international experience shows, managing human resources in education by simply increasing “control” over teachers raises their stress level and can lead to negative consequences for the education process. More importantly,

initiative and independence among school and university teachers are very powerful resources for renewing the content and methods of teaching. For this reason, the national project “Education” must be considerably expanded in the domain of the **radical modernization of the content and methods of preparing, training and re-training teachers**.

One must provide professional development grants to communities of teachers and administrators for introducing substantive and technological (digital) innovations and creating opportunities for the experimental work of individual teachers, teacher partnerships and entire schools.

It is impossible to promote student initiative and independence without promoting the professional development and creativity of teachers. We propose allocating competitive grants to teacher teams for developing, testing and providing curricular support for general school subjects aimed at inculcating personal and meta-subject skills.

It also necessary to develop high-tech teacher training programs with enhanced practical experience and create a system of post-degree curricular support for young teachers and internship programs for young teachers at the best education organizations and top universities. These measures will cost 9.5 billion rubles annually, on average.

It is important to note that, if one attempts to reform education without involving and motivating teachers, many changes are doomed to failure and will only lead to growing social tension. As extensive international experience of analyzing education reforms shows, integrated investments are a key condition of success: every ruble spent on technologies must be accompanied by a ruble invested in training teachers and securing their support for school reform. A key incentive is salary increases for teachers. This may be attained

Chapter 3. Prospects of Developing Education in the 12 Key Areas Through the Implementation of National Projects

by implementing all the aforementioned measures in general school education for saving resources, including the digitalization of the learning process.

Thus, along with the modernization of the content of education (cf. Section 3.11), personnel support serves as the foundation of all the other measures proposed in this book for developing Russian education. Without the help of qualified and motivated teachers working in comfortable and productive learning environments, it will be impossible to implement any of the federal projects. The supplementary measures proposed in this area will cost about 20 billion rubles. These investments will undoubtedly pay off.

CONCLUSION

Our analysis shows that Russian education policy has been moving in recent decades towards the modernization of education and the enhancement of its contribution to societal development. The Russian Presidential Directive of May 7, 2018, and the national projects adopted in its wake have set down the agenda of contemporary education policy as well as pointing to the ties between education and other spheres of social life. The attention accorded by the directive to preschool education, extracurricular education, vocational colleges, universities, and continuing education shows that the thesis of the decisive impact of education on socioeconomic development is widely accepted today.

Russian education as a sphere of the creation and development of human capital plays a visible role in the global arena today. Thanks to the initiated national projects (and, first and foremost, the national project “Education”), there is every reason to believe that this role will continue to grow in the future.

This is not sufficient, however. In a situation when Russia’s economic growth rate is below the world average and when “traditional” approaches to reforming socioeconomic systems “from above” have clearly demonstrated their ineffectiveness (for more details, see Chapter 1), human capital can act as a driving force that will reinvigorate the Russian economy and society and help to create new and more effective institutes by using the opportunities provided by contemporary technologies, among others.

As we showed in Chapter 1, human capital simply has no alternatives as the main driving force of growth in Russia today. The main areas of work for implementing this model in education were described in Chapter 2.

Conclusion

The priority importance assigned to education at the present time is putting increasing demand on this sphere. For this reason, we proposed significant additional measures to the national projects in Chapter 3. These supplementary measures can play a major role in augmenting the contribution of education to socioeconomic development. The problem does not simply lie in the fact that a longer planning horizon is needed — at least to the year 2030. Just as importantly, whole areas of work — supporting regional tertiary education systems, overcoming academic failure and inequality — have been largely overlooked by the national projects.

The key limitation is the underfinancing of education. This chronic Russian illness paradoxically coexists with declarations about the importance of education and, more recently, human capital.

The authors hope that this book will contribute not only to expert and scholarly discussion but also to the practical agenda of education policy, promoting the adoption of bolder, longer-term and more systematic measures for developing human capital.

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This volume elaborates the argument set forth in the whitepaper *12 Solutions for New Education* (prepared jointly by HSE University Moscow and Center for Strategic Developments in 2018).

The work is anchored in a comprehensive academic approach and draws upon a deep well of research and empirical data. The authors call for a renewed emphasis on the part that education can play in fostering sustainability and growth. Chapter II of the volume outlines a framework for the development of education as a pivotal driver of Russia's social and economic wellbeing. Chapter III presents guidelines and specific recommendations for how the stated goals could be achieved while focusing on roadmaps to educational change as part of Russia's nation-state development initiatives.

Intended for everyone interested in education, this study sets itself apart as arguably the only one conducted so far in Russia to offer research and insights just as broad and in-depth.

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