Educational Inequality and COVID-19 Pandemic: Relationship between the Family Socio-Economic Status and Student Experience of Remote Learning

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Abstract

The urgent transition to remote learning in March 2020 revitalized the debate on the influence of new educational reality on inequality in education. A study was performed to measure the relationship between the difficulties experienced by students during remote learning and their socio-economic status. Data from a nationwide survey of students administered in late March–early April 2020 by a team of researchers from a few Russian universities was used as empirical basis of this study. Results demonstrate significant differences in obstacles faced by students from families with different levels of income. Students from low-income families were the most likely to have technical and self-regulation problems and to lack skills required for effective remote learning. Results indicate the importance of finding system-level solutions to ensure equal opportunities for students in remote learning, regardless of their socio-economic status.

Keywords

remote learning, COVID-19, educational inequality, digitalization of education, student experiences, social isolation, academic self-regulation.

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In March 2020, Russian universities switched to remote learning to minimize the risks of COVID-19 spreading. Mass transition of most classroom-based programs to the online environment was performed within an extremely short period of time and became a challenge for

universities as well as students, who had to adapt to the new educational reality.

The impossibility of in-person instruction during a long period of time has revitalized the debate on how mass remote learning will affect inequality in higher education [Lederman 2020; Williamson, Eynon, Potter 2020; Chan 2020; Arnove 2020; Aucejo et al. 2020; Soria, Chirikov, Jones-White 2020]. International findings show that students who were moved to remote learning struggle to stay motivated to learn effectively in the new format [Soria, Chirikov, Jones-White 2020; Means, Neisler 2020], suffer from isolation and a lack of interpersonal connections with instructors and fellow students [Soria, Chirikov, Jones-White 2020], experience an increased level of stress [Soria et al. 2020; Chirikov et al. 2020], and spend more time preparing for classes [Aucejo et al. 2020]. All these changes in learning may have negative effects on educational outcomes. Students from low-income backgrounds experience more barriers in their adjustment to online learning and can be a more vulnerable group than their peers from wealthier families [Soria, Chirikov, Jones-White 2020]—and this is also true for Russia.

The present study contributes to the debates on how the transition to remote learning during the COVID-19 pandemic affected the inequality in higher education. Data from a Russian nationwide survey of students administered in March–April 2020 by order of the Ministry of Science and Higher Education is used to analyze socio-economic status (SES) differences in how students managed through the transition to remote learning due to the COVID-19 pandemic and in the barriers that they faced in their adjustment process. Findings from this study will be used to formulate hypotheses as to which characteristics of remote learning increase educational inequality between students from different socio-economic backgrounds and to suggest possible ways of mitigating those effects.

1. Digital Technology and Educational Inequality: A Review of Literature

Online learning, in particular Massive Open Online Courses (MOOCs), was expected to reduce inequality in access to education [Bekova et al. 2020]. However, there is empirical evidence that learning in this format can exacerbate rather than reduce SES differences in educational outcomes [Hansen, Reich 2015, Kizilcec, Davis, Cohen 2017]. During the pandemic, mass transition to remote learning became the only way to prevent disruption of the educational process, but it also raised the risks of exacerbating inequality in a few dimensions.

The first dimension of inequality has to do with lack of access to the Internet and necessary devices. According to research, Internet usage penetration among people aged 30 or younger in Russia reached 99% in 2018[1]. However, it does not mean that there are no technolog-

[1] GfK (2019) Internet Usage Penetration in Russia: 2018 Year in Review: https://cdn2.

ical barriers in online learning. First, the level of Internet penetration is growing at the expense of mobile Internet users, whose proportion is rather high among youth[2]. Forty-one percent of young people access the Web from mobile devices[3]—which are not an optimal choice for effective learning. Second, broadband speed, prices, and penetration vary greatly between regions of Russia as well as within them, depending on the size of locality[4]. Third, research shows that access to the Internet and digital equipment (computers, laptops, etc.) varies as a function of income and type of locality [Sabelnikova et al. 2018].

The second dimension of inequality is individual disparities in Internet usage, which can bring people with equal Internet access opportunities to different educational outcomes. Findings suggest that, although Internet access is becoming ubiquitous, Internet uses are not homogeneous: people with higher levels of education use the Web for education and career advancement, while those with lower levels of education use it largely for entertainment [Hargittai, Hinnant 2008; Volchenko 2016]. Remarkably, differences are observed even in using the same web resources [Smirnov 2018].

Transition to remote learning required students as well as professors and other university staff to embrace new communication platforms and improve their digital literacy skills. Today's students, as well as the entire generation born roughly between 1980 and 1994, have been characterized as the "digital natives" or the "Net generation" because of their familiarity with and reliance on information and communications technology (ICT) [Bennett, Maton, Kervin 2008]. However, researchers found that university students do not really have deep knowledge of technology, and what knowledge they do have is often limited to surfing the Internet, emailing, and basic office suite skills [Kirschner, Van Merriënboer 2013]. Students entering colleges often suffer from a lack of computer literacy, despite the fact that there is a widespread perception that modern students are extremely knowledgeable [Keating 2014]. Meanwhile studies show that respondents with the highest level of comfort and confidence using online learning technology perceive significantly fewer barriers for social interaction, administrative/instructor issues, and technical problems [Muilenburg, Berge 2005]. Remote learning also requires specific skills, knowledge, and experience, in particular the ability to self-motivate and develop

hubspot.net/hubfs/2405078/cms-pdfs/fileadmin/user_upload/dyna_content/ru/documents/press_releases/2019/gfk_rus_internet_audience_in_russia_2018.pdf

[2] https://mediascope.net/news/1067271/

[3] GfK (2019) Internet Usage Penetration in Russia: 2018 Year in Review: https://cdn2.hubspot.net/hubfs/2405078/cms-pdfs/fileadmin/user_upload/dyna_content/ru/documents/press_releases/2019/gfk_rus_internet_audience_in_russia_2018.pdf

[4] Yandex (2016) Internet Development in Regions of Russia: https://yandex.ru/company/researches/2016/ya_internet_regions_2016#stoimostiskorostdostupavinternet; Speedtest (2018) A Brief Analysis of the Russian Market and Speedtest Results in 2018: https://www.speedtest.net/reports/ru/russia/

learning strategies [Milligan, Littlejohn 2013; 2014], a high level of critical thinking [Schunk, Zimmerman 2008; Artino, Stephens 2009], and previous online learning experience [Wang, Newlin 2002; Lim, Yoon, Morris 2009]. Studies of Russian students who take online courses as part of their university programs show that successful learning is largely contingent on students' ability to organize their study space, allocate enough time to study in this format, set goals, and reflect on the learning process and their progress [Bekova et al. 2020].

Evidence from research demonstrates a substantial variation in the difficulty of transitioning to remote learning depending on the level of education, parental education, and field of study. The most vulnerable groups include first-generation students [Soria et al. 2020], undergraduate students [Chirikov et al. 2020], science, technology, engineering, and mathematics (STEM) students, and students majoring in arts and design [Soria, Chirikov, Jones-White 2020]. In addition, remote learning experiences and perceptions differ significantly as a function of SES. A survey of over 22,000 undergraduate students at five leading U.S. public research institutions revealed that students from low-income families are much more likely to suffer from a lack of access to technology and an appropriate study space for remote learning [Soria, Chirikov, Jones-White 2020]. Such students are also significantly more likely than their peers to experience financial hardships and major depressive disorder during the COVID-19 pandemic [Soria, Horgos 2020]. A survey of students at one of the largest public institutions in the United States showed that lower-income students are more likely than their higher-income peers to expect to delay their graduation because of COVID-19 [Aucejo et al. 2020].

The present article uses data from a cross-sectional survey of Russian university students to find out how students of different socio-economic backgrounds differ along two dimensions of inequality: (a) learning conditions and access to technology and (b) skills useful in remote learning.

2. Data

Data from a nationwide student survey conducted on behalf of the Ministry of Science and Higher Education between March 25 and April 3 2020 by an inter-university team of sociologists representing National Research University Higher School of Economics, ITMO University, Ural Federal University, and Tomsk State University formed the empirical basis of research. Data was collected online using two recruitment techniques: (a) contextual targeting in the social network VKontakte displaying ads with the link to the questionnaire to users aged 17–23 and (b) distribution of the link to the questionnaire among students by university administrators as a piece of news at the official website or via email. Any user with access to the link could participate in the survey.

All respondents who followed the link were asked screening ques-

tions. Only those who reported being enrolled in a full- or part-time higher education program could proceed with the questionnaire.

Over 11,500 users passed the screening test and completed the questionnaire. As students from different universities were represented disproportionately, the sample was adjusted. For example, 50% of randomly selected responses obtained from two universities with the number of respondents exceeding 500 were excluded from analysis to neutralize the university effect. The final sample consisted of 10,018 questionnaires completed by students from 647 Russian universities. The questionnaire was dedicated entirely to the use of remote learning technology by universities and the measures that they took to prevent COVID-19 from spreading. Descriptive statistics of the sample are given in the Appendix.

3. Variables and Analysis

The following indicators were used to assess the technological infrastructure and learning environment of students in remote learning:

- Access to devices ("Please select all types of devices that you have access to"; "Apart from you, who else has access to this equipment?")
- Quality of devices ("Do the devices accessible to you meet all the functional requirements for learning?")
- Characteristics and quality of Internet connection ("Do you have access to the Internet at your current place of residence?"; "Do you experience technical or network connectivity problems?")
- Overall perception of technical challenges ("What technical constraints did you encounter after the transition to remote learning?")

Challenges encountered by students in remote learning were assessed by asking them the question, "Does remote learning present any challenges to you?" Respondents were asked to select all that applied from the following:

1) I struggle to find an appropriate study space for remote learning.
2) I am uncomfortable with the instructor asking me to turn my camera on.
3) I have no suitable devices (e. g. a computer with Internet access) for remote learning.
4) I find it difficult to understand the interface of online courses and remote learning programs.
5) I find it difficult to remain focused when watching video lectures.
6) I find it difficult to focus during self-study.
7) I find it difficult to ask the instructor questions in the absence of in-person classes.
8) I find it difficult to answer questions or ask instructors for clarification online.

9) I cannot discuss learning material with my classmates.
10) I lack interactions with my classmates.
11) I lack in-person discussions with instructors.
12) I feel lonelier and more isolated in remote learning.
13) I find it difficult to study from home.
14) I experience technical and network connectivity problems.
15) Remote learning is not an issue for me.

Household purchasing power was used to assess students' SES. Respondents were asked to answer the question, "How would you describe your family's financial situation?" by choosing one of the following options:

- We live a frugal life and have just enough money to cover basic daily living expenses, but buying new clothes is a challenge." (Group 1)
- We have enough money for food and clothes, but buying major appliances is a challenge unless we take out a loan." (Group 2)
- We are basically well-off but would have to take out a loan or save money to buy a car or go on an expensive vacation." (Group 3)
- We are well off and can easily afford to buy a car or go on an expensive vacation." (Group 4)

4. Survey Results

4.1. Challenges of Remote Learning

Data from the survey shows that the transition to remote learning raised a number of challenges for students, many of which were widespread (Figure 1). Only a quarter of respondents reported having had no problems moving to remote learning. The most widespread obstacles were technological barriers and problems associated with specific characteristics of remote learning as such and a lack of relevant skills. In particular, over one third of students said that they lacked interactions with peers and professors and experienced technical and network connectivity problems. This is largely in line with the international findings describing the lack of interpersonal connections with fellow students and instructors as a major obstacle to effective remote learning (for example, [Soria, Chirikov, Jones-White 2020]). At the same time, evidence from Russia indicates a high incidence of technical problems related to access to digital equipment and the Internet. Below, we will zero in on the two categories of obstacles—(a) technical barriers to the transition to remote learning and (b) specific characteristics of remote learning and lack of necessary skills—and show whether their impact varies as a function of SES.

4.2. Access to Digital Equipment

Data obtained from the online survey does not allow assessing adequately the technology component of inequality in access to remote learning. Yet, it is sufficient to measure SES differences in access to digital equipment. On average, students who have no access to any device other than a mobile phone account for 6% of the sample, but

Figure 1. **Proportions of students facing obstacles in remote learning**, *%*

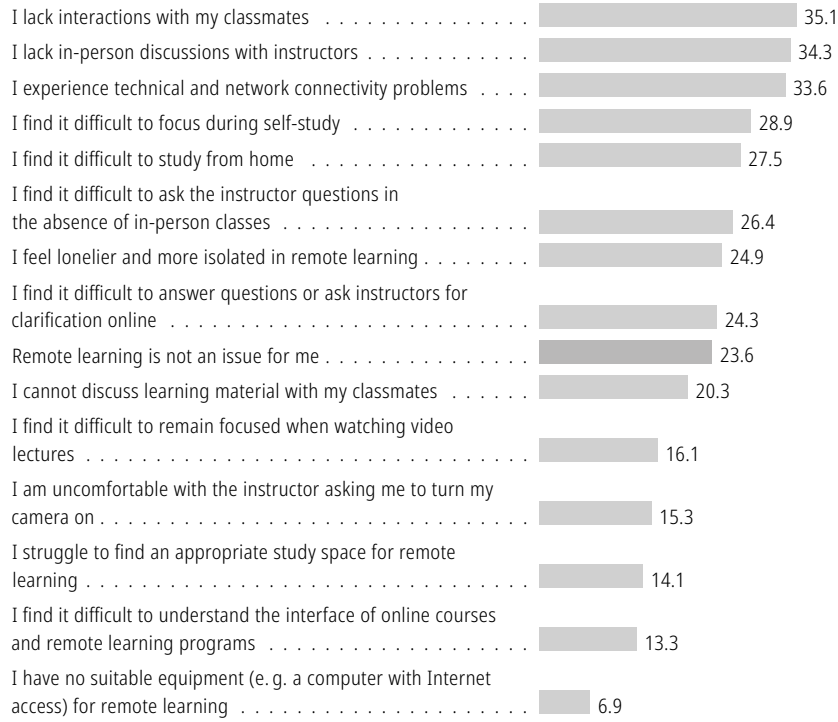
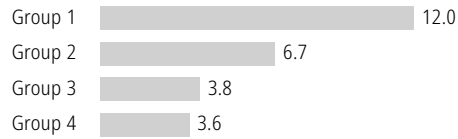


Figure 2. **Proportions of students who have no access to equipment for remote learning, by income groups** (Group 1 representing students from the lowest-income families), %



the proportion is twice as high in the lowest-income group and twice as low in the highest-income group ($\chi 2 = 123.773$, $p < 0.000$) (Figure 2).

In fact, 12% of low-income students have no access to computer, laptop, or tablet and use their mobile phones for learning. They are also less likely to use fixed broadband and more likely to use mobile Internet: 43% compared to 33% in the highest-income group ($\chi 2 = 19.942$, $p < 0.000$). Furthermore, student from low-income backgrounds are more likely to experience technical and connectivity problems (40.5% compared to 27.6% in the highest-income group, $\chi 2 = 43.636$, $p < 0.000$).

Figure 3. **Access to digital equipment by income groups**, *%*

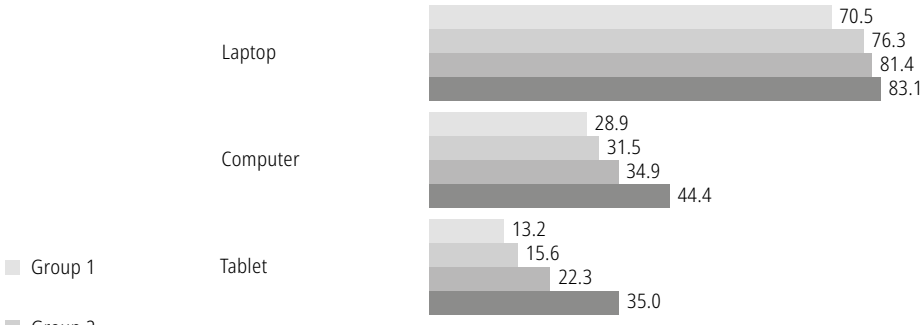
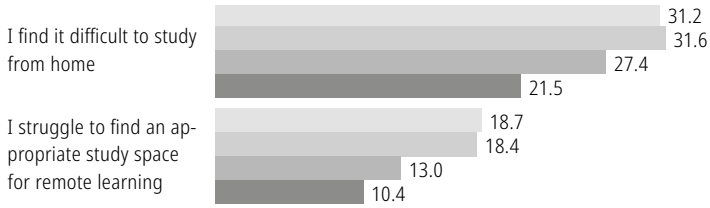


Figure 4. **Obstacles related to remote learning environment, by income groups**, *%*



More students from the highest-income group have access to all types of digital equipment than in any other income group (Figure 3). As a result, the proportion of those who had no technical issues moving to remote learning is significantly higher in Group 4 (78.3% compared to 62.8% in the lowest-income group, $\chi 2 = 99.631$, $p < 0.000$).

4.3. Obstacles Related to Specific Characteristics of Remote Learning

Apart from access to digital equipment, a few more prerequisites are required for effective remote learning. One of them has to do with the learning environment, specifically with access to a comfortable study space where distractions are minimized and the student can put her/his whole mind on the learning process [Bekova et al. 2020].

The survey reveals essential variance in this parameter across the income groups (Figure 4). For example, the lowest-income group features the highest percentage of those who find it difficult to study from home ($\chi 2 = 31.409$, $p < 0.000$) and those struggling to find an appropriate study space ($\chi 2 = 53.159$, $p < 0.000$).

A high degree of technical competence is another prerequisite for effective remote learning [Martin 2012; Bali 2014]. Lack of necessary skills shows a statistically significant correlation with family income (Figure 5). Students from low-income families are much more likely to face difficulties because of their lack of skills for effective remote

Figure 5. **Difficulties in the transition to remote learning as a function of family socio-economic status**, *%*

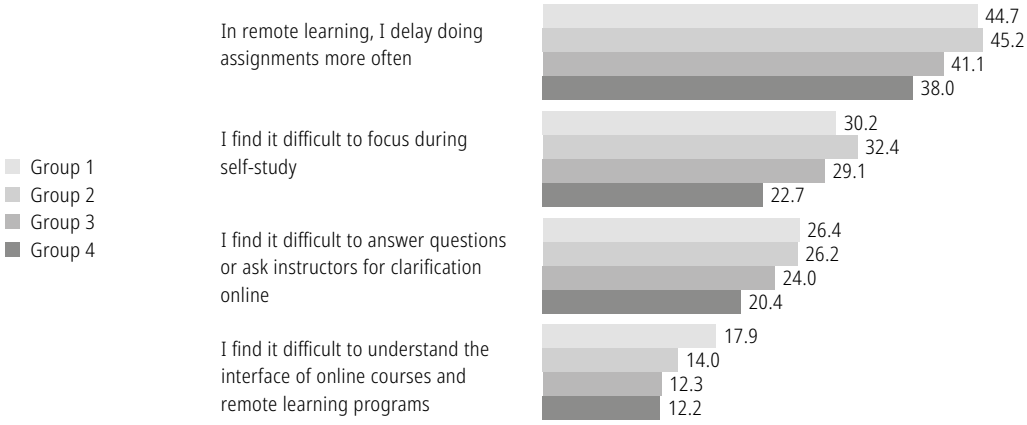
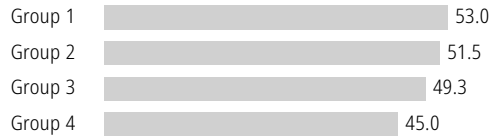


Figure 6. **Perceived effectiveness of remote learning as a function of family SES**, *%*



learning. In particular, they find it difficult to answer questions or ask instructors for clarification online (26.4% compared to 20.4% in the highest-income group, $\chi 2 = 11.430$, $p < 0.05$) as well as to focus during self-study (30.2% compared to 22.7% in the highest-income group, $\chi 2 = 23.068$, $p < 0.000$), and they are more likely to experience difficulties understanding the interface of online courses and programs (17.9% compared to 12.2% in the highest-income group, $\chi 2 = 23.383$, $p < 0.000$) and to delay doing assignments in the remote learning format (44.7% compared to 38.0% in the highest-income group, $\chi 2 = 15.594$, $p < 0.01$).

4.4. Perceived Effectiveness of Remote Learning

Results of the present study allow assuming that disparities in remote learning environments and experiences between students from different socio-economic backgrounds may lead to inequality of educational outcomes (Figure 7). Although the study did not imply collecting data on students' performance or other objective indicators of their academic success, the questionnaire contained an item asking how students perceived the effectiveness of remote learning. Perceptions were found to vary significantly depending on family SES: 53% of stu-

dents from the lowest-income group agreed that remote learning was less effective than in-person instruction, compared to 45% in the highest-income group ($\chi 2 = 11.883$, $p < 0.01$).

5. Conclusions and Discussion

The urgent and mass transition to remote learning in March 2020 due to the COVID-19 pandemic became a stress test for the Russian system of higher education [Barannikov et al. 2020]. It revitalized, and in some cases sharpened, the debate around higher education, its problems and prospects of development. One of the most important discussions—not only in Russia but worldwide—is the one about the influence of mass transition to remote learning and teaching on manifestations of inequality in access to higher education [Lederman 2020; Williamson, Eynon, Potter 2020; Chan 2020; Arnove 2020].

The present study contributes to this discussion, demonstrating empirically that remote learning may exacerbate the inequality of educational opportunity between students from different socio-economic backgrounds. Our findings are largely consistent with the results of some studies, which found that students from low-income families faced more challenges transitioning to remote learning than their more economically advantaged peers [Aucejo et al. 2020; Soria, Chirikov, Jones-White 2020; Soria, Horgos 2020]. In particular, essential variance is observed in access to digital equipment among students from different income groups as well as in the severity of problems that they experienced due to the lack of an appropriate study space and specific skills required for effective learning in this format.

Limited access to devices suitable for remote learning and inappropriateness of learning environments among students from lower-income groups are easy to understand and explain. The gap between students of low- and high-income backgrounds may affect educational outcomes. Universities can mitigate the effects of such differences by monitoring students' access to digital equipment to identify vulnerable groups, providing necessary equipment to students in residence halls, or developing individualized learning plans with regard to access to remote learning technology.

Instructors should also take the existing limitations into account. When delivering classes and designing homework and test assignments, they should keep in mind that some learners may connect via mobile devices and avoid mandatory camera policies so as to prevent exposure of low economic status or difficult living situations, which may have long-term negative psychological effects[5].

SES disparities in students' technical competence may be related to differences in their patterns of online activities: difficulties understanding the interface of platforms and embracing the remote learn-

[5] https://www.stanforddaily.com/2020/06/01/please-let-students-turn-their-videos-off-in-class/

ing format may indicate that learning is not a regular online behavior for low-SES students. Despite the active use of technology in life, students struggle to use specific online platforms. In order to prevent such obstacles from becoming a factor affecting educational outcomes, universities could offer brief training courses and various instructions to help students learn new practices. It would also be expedient to reduce the diversity of platforms and programs used in remote learning to decrease student workload.

The present study has a few peculiarities that impose limitations on data interpretation. Firstly, the sample cannot represent all students of Russian universities due to the use of convenience sampling. Some institutions, majors, courses, and modes of study are represented more strongly, while some universities are underrepresented or not represented at all. Research design does not allow controlling for this sampling bias in analysis and therefore extrapolating the inferences made from the sample data to the whole population of Russian university students. Yet, this sample is appropriate for comparing student groups by various indicators, which was performed in the present study.

Secondly, we cannot assess effectiveness of remote learning across specific student groups on the basis of course progress and educational outcomes. We can only suggest, relying on previous findings, that there is a relationship between obstacles in remote learning and educational outcomes.

Thirdly, assessment of access to digital equipment was limited in that it was administered online and thus originally selected students with access to the Internet, devices, and social media. Due to the method of data collection, the survey did not include students who had no access to the resources mentioned. Participation of such students would allow a more accurate assessment of the severity of technical problems associated with the transition to remote learning. The online method of data collection was chosen as the most time- and cost-efficient and the safest one during the pandemic.

Despite the limitations mentioned above, the present study allows describing the situation faced by students in 2020 and formulating hypotheses about its impact on the inequality of educational outcomes. Meanwhile, the following problems remain unsolved and require further investigation: inequality of students in different regions and types of university, relationship between economic consequences of the pandemic and educational trajectories of students from different income groups, and disparities in educational outcomes between students from different socio-economic backgrounds.

Appendix

Table 1. **Key sample characteristics.**

Variable	Sample percentage,%
Gender	
Male	30
Female	70
Mode of study	
Full-time	98
Part-time	2
Field of study	
Natural Sciences (Chemistry, Biology, Physics, etc.)	10
Mathematics	2
Economics and Management	15
Computer Science	7
Engineering, Technology, and Science	18
Social Sciences (Sociology, Psychology, etc.)	11
Education and Pedagogical Sciences	8
Humanities (Philosophy, Philology, etc.)	14
Arts and Culture	3
Healthcare and Medical Sciences	6
Agriculture and Agricultural Sciences	2
Defense and National Security, Military Sciences	1
Don't know	2
Level of education	
Bachelor's degree	76
Specialist's degree	17
Master's degree	7
Year of college	
Final year	18
University status	
Project 5–100 university	14
National research university	12
Federal university	7
Flagship university	12
No special status	67

Variable	Sample percentage,%
How would you describe your family's financial situation?	
We live a frugal life and have just enough money to cover basic daily living expenses, but buying new clothes is a challenge	12
We have enough money for food and clothes, but buying major appliances is a challenge unless we take out a loan	23
We are basically well-off but would have to take out a loan or save money to buy a car or go on an expensive vacation	57
We are well off and can easily afford to buy a car or go on an expensive vacation	8

Translated from Russian by I. Zhuchkova.

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