

Assessment of the Role of a Tutor in Implementation of Individual Educational Strategy of a University Applicant

Denis Bogomolov (✉ bogomolovdenis@yahoo.com)

Pervyj Moskovskij gosudarstvennyj medicinskij universitet imeni I M Secenova <https://orcid.org/0000-0003-2146-7147>

Alexandr Grinev

Pervyj Moskovskij gosudarstvennyj medicinskij universitet imeni I M Secenova

Iza Berechikidze

Pervyj Moskovskij gosudarstvennyj medicinskij universitet imeni I M Secenova

Svetlana Larina

Pervyj Moskovskij gosudarstvennyj medicinskij universitet imeni I M Secenova

Tatyana Degtyarevskaya

Pervyj Moskovskij gosudarstvennyj medicinskij universitet imeni I M Secenova

Research article

Keywords: applicant, high school student, individual educational strategy, medical university, tutor

Posted Date: March 17th, 2020

DOI: <https://doi.org/10.21203/rs.3.rs-17560/v1>

License:  This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Background Nowadays the specialist program of medical profile is one of the most popular admission programs among university entrants. The study is aimed at assessment of the tutor's role in the implementation of the applicant's individual educational strategy basing on the example of preparation for the exam in biology for admission to a medical university.

Methods The study is basing on the hypothesis that the tutor is an important, but not essential component of an individual educational strategy for entering a medical university. More than 100 first-year students of the Sechenov University took part in the questionnaire survey to implement the goals and objectives of the research. The survey results were analyzed using specialized statistical packages. Standard methods of descriptive statistics, correlation analysis, clustering methods were used.

Results As a result various IES were identified and several features of the interconnection of the IES and the results of USE were studied. In the framework of this study, various educational strategies that are implemented by the student were identified and analyzed, including the students of schools participating in the program "Medical class in Moscow school" and "Sechenov Pre-university", so, it gives an opportunity to assess the effectiveness of profile orientation within the biological profile and to extrapolate findings to similar programs of profile orientation of education in high school.

Conclusions This study provides an opportunity to assess the effectiveness of a particular educational strategy and can help to choose the right path in preparation for admission to medical university. Trial registration Retrospectively registered.

Background

The problem of the component composition of individual educational strategies is an actively discussed question, both in the Russian pedagogical Society and abroad. In recent years in this area of research the world scientific community has identified several components, each of which deserves separate and more detailed discussion [1, 2]. The first and most obvious point is the question of students' self-identification, the problem of their professional self-determination and the choice of further professional development trajectory. This problem is considered both at the stage of school education [3–5], and at the stage of transition from school education to higher education (for example Colleges or universities [6] and further, in the process of studying in a higher educational institution) [7]. The second point of discussion is the role of tutoring in individual educational strategy building. It is obvious that such attention of the teaching community is connected also with the economic features of this type of educational services. For instance in 2010 it was clearly demonstrated that nowadays private tutoring represents a large independent sector of the economy, which is not only actively developing, but also allows a different point of view on the social stratification issues in the field of educational services [8]. In addition, some researchers raise the question of correlation between the level of wealth and education of parents in families where children use the tutor services [9]. The problem of large, medium and small

studies in the field of shadow education has been raised, many citations have been pointed out, and the main questions to this research type have been posed, however, even despite such a complete and detailed review, the question of individual educational strategies composition in the process of studying specialized, not general subjects, is still open. The author also notes the discrepancy of the data even in large studies on this issue. Large studies of this problem were also carried out in Bangladesh [10], Taiwan [11], North Korea [12], Hong Kong [13], Germany [14], America [15], and Japan [16]. Despite the international (including the post-Soviet space [17]) interest to the topic of various educational strategies there is a lack of such studies in Russia. According to Edumarket.digital research, in 2016 the additional education market volume for schoolchildren in the Russian Federation amounted to 130, 3 billion rubles, and by 2021 it will reach the level of 149 billion. In international periodicals, the numerous options for educational offers provided in parallel with compulsory school education are commonly called "Shadow Education", due to the fact that these programs like a shadow repeat all changes in compulsory education programs. The topic of additional educational services became the most acutely discussed in the pedagogical community after the publication in 2014 of the article [18] in which the authors suggest that the lesson with a tutor in high school does not lead to a significant improvement in the knowledge of students and is, at least, optional. It is impossible to disagree with a number of conclusions of the respected authors. For example, the authors of this research suppose support the idea that the shadow market of educational services by its development strengthens the existing social stratification and assumes unequal access to educational products for different groups of the population. However, while working at the university, and, in particular, with first-year students, it becomes obvious that most of them used the services of a tutor, preparatory courses, or both [19].

The survey from Surgut Pedagogical University also discussed the role of a tutor in preparing for the Unified State Exam [20]. In the study, it was demonstrated that almost half of all students were engaged with a tutor at the stage of admission to the HES. In some works even the question of the usefulness of modern school education is raised, taking into account the fact that almost all students are studying with a tutor [4].

Despite aforesaid the authors of this research have not found works that offer to look at the issue of additional educational services in terms of their correlation with a high degree of profile orientation of education in high school. At the same time, the problem of specialized education and, in particular, chemical-biological and medical, is discussed in the literature. The questions of social and psychological adaptation of first-year students to the loads after training in specialized classes [21] are considered in detail, the question of the loads that students face while studying in classes with a high degree of specialization [22] is studied. It is also worth noting that the topic of specialized education in general is also considered in scientific periodicals. For example, in one study [5] the authors raise the issue of students' awareness of the profile choice and draw attention to the need to take into account the characteristics of each specific profile class. However, it is important to note that in our opinion the question of the correlation of additional and school education in real individual educational strategies should be studied more carefully. As a result, with all the amount of information, both scientific and near-scientific, it is still difficult for students and their parents to make a choice. It is also possible to consider

the correlation of these components in the framework of the educational trajectory in the process of entering medical specialties at a university. The realities of modern secondary and higher education in the Russian Federation dictate the need for practical implementation of diverse, flexible and non-standard approaches to the process of preparation for entry to higher educational institutions by high school students and their parents. It is necessary to recognize that the Unified State Exam (which is considered to be the analogue of US Scholastic Aptitude Test), in spite of certain shortcomings, plays an extremely important role in modern Russian society, equalizing the chances of applicants for admission, regardless of their place of residence, social status and, often, financial resources.

Nowadays, high school students (and their parents) before choosing the university should take into account medium-term and long-term trends in the labour market, analyze potential for international integration of the future specialist, consider various scenarios for the practical application of their knowledge, etc. The conditions of the modern educational market dictate a more pragmatic approach to the selection of existing educational products. Just a few of the applicants choose future profession only “on the call of the heart” or “by vocation”: high school students prefer to stay more mundane and pragmatic in this choice. Applicants can choose various programs of high school education or join a class with a profile orientation. In particular, in Moscow there are such successful programs as “Medical class in Moscow school”, “Engineering class in Moscow school” and others. Many Russian schools have so-called “academic” classes. A common phenomenon in secondary education in the Russian Federation is specialized schools with in-depth study of certain subjects. Moreover, in some Russian megalopolises the project “Pre-University” has been launched and is being successfully implemented. Resource centres “Sechenov Pre-University”, “Pre-University of the RSUH”, “Pre-University of the NRNU MEPhI” and others have been successfully operating in the capital for several years. Even before admission, students get acquainted with the specific requirements of the University and have an opportunity to study at preparatory courses. In addition, traditionally in the framework of preparation for the final exam, Russian high school students choose individual lessons with a teacher, who specializes in the particular subject (tutor). A variety of modern forms, methods and directions of education and preparation for entering the university, as well as the deliberate choice of future profession, taking into account trends in the global labour market, allows applicants to form and implement an individual educational strategy, which serves as the foundation and determines further professional activity.

“Individual educational strategy” (IES) is a planned and consistently implemented set of actions of an applicant aimed at achieving at least two goals: a) entering a predetermined university and b) formation of stronger starting positions (theoretical training, practical work skills) in relation to other first-year applicants / students.

Methods

Research design

The cross-sectional design was taken as the methodological basis of the study. Descriptive and correlation characteristics were calculated. Static groups were compared. The actual basis of the study was a sample of anonymous questionnaires, specially prepared for this work. Questionnaires were randomly labelled by unique numbers. Questionnaires were collected by persons who did not participate in the study. Respondents were forbidden to sign the questionnaires and make any notes that made it possible to identify the person surveyed. All respondents were adults and agreed (verbally) to participate in survey. The questionnaire contained twelve points. Each point in the questionnaire included from two to six statements. Students were asked to choose only one of the statements in the point that, in the respondent's opinion, most accurately reflected reality.

Sample and survey

The survey was conducted among first-year students of I.M. Sechenov First Moscow State Medical University during the first semester (when all students were instructed at the department of Biology and General genetics) of 2018–2019 academic year. The General population was 164 respondents. The survey was fully voluntary. Preliminary analysis of the obtained material showed that 5 questionnaires were spoiled. The material of 159 questionnaires was analyzed.

This volume of the general population of respondents (up to 200 people) was chosen basing on the recommendations for preliminary (pilot) sociological research in the “primary selection units”, which may include the first year of medical university [21].

Data analysis

Statistical processing of the obtained actual material was carried out using the statistical package Microsoft Excel for MacOS. In addition, the specialized statistical program Orange 3 was used for the material processing. In the framework of the study standard and advanced methods of descriptive statistics were used. At all stages of obtained material processing the variance value was calculated (univariate analysis of variance), data correlation analysis and data clustering were used (Cosine and Euclidean Distance metric).

Research limitations

It should be emphasized that the objectives of this study did not include an assessment of the quality of the tutor's work. The fact is that it is almost impossible to carry out such an assessment in the conditions of complete opacity of the market of individual educational services in Russia. The level of tutors training, their pedagogical skills cannot be assessed basing on the subjective assessments of the surveyed students. The criterion of “price for one lesson” is also not representative, since the cost of such services varies greatly depending on the region, the regalia or rating of the tutor, etc.

Results

It was suggested that within the framework of the individual educational strategy implementation an applicant (and / or his parents) responsibly searched for a private teacher and, as a result, chose the

most optimal option. It can be assumed that the economic and geographical factor will be one of the conditions that can affect the choice of an individual educational strategy, as well as the inclusion of a tutor in the process of preparing for the USE and entering the university. Applicants from Moscow, the Moscow region and large Russian megacities may have initially better starting positions compared to high school students living in ordinary, not large Russian cities, regional centres, urban-type settlements and villages.

The analysis of questionnaires showed that among the 159 surveyed first – year students, 73 are graduates of Moscow schools, five are graduates of secondary schools from other Russian cities, 67 students received secondary education in regional centres or in other cities of the Russian Federation, another 8 people were students of schools in urban settlements or villages, and six students received secondary education abroad.

It should be noted that the small number of students from other Russian cities, most likely can be explained by the fact that school graduates from megacities often prefer to enter local medical schools, and not to go to study in Moscow. At the same time for school graduates from regional centres and other small cities of the Russian Federation, admission to a Moscow university is a significant (sometimes determining) step in the implementation of an individual educational strategy. Therefore, their number is almost equal to the number of graduates of Moscow schools. Classes with a tutor in biology are, in fact, a prerequisite for preparation for the USE and university admission and, therefore, an important element of the IES.

120 of the 159 surveyed students (75.5%) at least once used the services of a tutor. 27 students (22.5%) worked with a tutor for two years (10–11 grades), and 61 applicants (50.8%) were constantly engaged with a private teacher in a graduation class. 39 entrants (24.5%) did not study with a tutor (Table 1, Fig. 1).

Table 1
Private lessons with a tutor

	Moscow school	School in another megapolis	Regional center / other town of the Russian Federation	School in the urban-type settlement/ village/ hamlet	Secondary education outside the Russian Federation
Tutor. 10–11 grades.	9	0	14	3	1
Tutor. 11 grade.	30	4	25	1	1
Tutor. 11 grade. Irregularly.	8	0	6	1	1
Tutor. 11 grade. Regularly. Half of a year.	7	0	4	0	0
Tutor. Several lessons.	4	0	1	0	0
No tutor.	15	1	17	3	3
$\Sigma = 159; P = 0.002; \mu = 5.3; SE = 1.39; \sigma = 7.66$					

[Table 1 here]

[Figure 1 here]

Regular classes in the eleventh (final) class throughout the school year were the most common (popular) option of interaction with a tutor. Apparently, classes with a tutor in the profile subject throughout the school year in the final class, from the point of view of applicants (and / or their parents), is the most optimal form of preparation for the exam. However, using the results of the exam as the main criterion for assessing the effectiveness of the tutor, the following correlation was found (Table 2).

Table 2

The dependence of the exam results on the duration of classes with a tutor (the most important pairs)

Private lessons with a tutor	Correlation value (r)
11 grade; six months – 11 grade; regular classes	0.971
11 grade; six months – 10–11 grades; regular classes	0.956
11 grade; regular classes – 10–11 grades; regular classes	0.932
No tutor Several lessons with a tutor	0.462

[Table 2 here]

It should be noted that the results of correlation analysis largely coincide with clustering (Fig. 2).

[Figure 2 here]

Basing on the obtained results it can be assumed that with proper intensity and organization of the preparation process regular semi-annual classes with a tutor are not less effective than classes with a tutor during the whole academic year in 11th grade.

A summary of the USE results and options for classes with a tutor are presented in Table 3 and in Fig. 3.

Table 3
Duration of classes with a tutor and exam results

	1 – Tutor. 10–11 grades.	Tutor. 11 grade. Regularly.	Tutor. 11 grade. Irregularly.	Tutor. 11 grade. Half of a year.	Tutor. Several lessons.	No tutor
Below 60 points.	0	3	3	1	0	3
60–70 points.	7	20	4	3	2	5
70–85 points.	13	21	6	4	3	16
85–100 points.	7	16	3	3	0	15
100 points (Olympiad).	0	1	0	0	0	0
$\Sigma = 159; P = 0.01; \mu = 5.3; SE = 1.15; \sigma = 6.33$						

[Table 3 here]

[Figure 3 here]

Graduates of the resource centre “Sechenov Pre-University”, medical classes in Moscow schools, working in the framework of the Pre-University program, as well as students from academic classes, teaching in which is carried out according to specially developed programs enter I.M. Sechenov First Moscow State Medical University. Moreover, the University enrolls students who studied in classes with a different (not biological) specialization or who studied in ordinary secondary school.

As shown by the survey, regardless of which class the applicant was in, the classes with a tutor turned out to be preferable for the overwhelming majority. 120 respondents of the 159(0.75) somehow used the services of a tutor, and 39 (0.25) did not work with a tutor. These data confirm our assumption that tutoring plays an important role in the individual educational strategy. In addition, it can be assumed that students choose individual classes, regardless of the class specialization they study in (up to the RC “Moscow Pre-University”) because the tutor: a) is able to provide additional knowledge and teach material that goes beyond the school curriculum and b) tutoring is a kind of “insurance” even in the case of training in a specialized academic class or in the Pre-University (Table 4).

Table 4
Private lessons with a tutor. Different class specializations

	Moscow preuniversity / medical class in Moscow school	Academic biological class	The class of other specialization / class without specialization
Studied with a tutor	25	37	58
Was not engaged with a tutor	8	18	13
$\Sigma = 159; P = 0.6; \mu = 26.5; SE = 7.5; \sigma = 18.4; r = 0.36$			

[Table 4 here]

The ratio between students who studied with a tutor and those who did not use the services of private teachers, regarding class specialization is as follows:

- Sechenov Pre-university / Moscow medical class – 25:8 (3.13)
- Academic class – 37:18 (2.06)
- Class without profile orientation – 58:13 (4.7)

At the same time, the analysis of the average exam results of graduates of classes with different specialization did not reveal significant differences. The average score (on a five-point scale) in all three cases was about 3 (from 2.8 to 3.2). Thus, graduates of the Sechenov Pre-University (Moscow medical class) showed an average score 3.2. Graduates of academic biological classes, as well as graduates of academic classes of other specialization and non-specialized classes showed the same average score – 2.8.

The system of calculating the average score was as follows:

- 1 point – USE results below 60 points,
- 2 points – USE 60–70 points,
- 3 points – USE 70–85 points,
- 4 points – USE 85–100 points,
- 5 points – the winner of the Olympiad (100 + points).

The data are shown in the Fig. 4.

[Figure 4 here]

It is worth noting that a certain (though a small) shift towards higher scores on the Unified State Exam (3.2 to 2.8) among graduates of the Sechenov pre-university or medical classes working in the pre-university program with respect to graduates of academic biological classes (classes with a different specialization / without specialization) is confirmed by the trend lines in the diagram.

There is a particular interest in the results of USE applicants who, in implementing their individual educational strategies, did not use the services of a tutor. Among the respondents, 39 of first-year students (24.5%) were not engaged with a tutor. Summarized data on the results of the unified state examination are presented in the Table 5.

Table 5
Exam results in biology (without the help of a tutor)

	Less than 60 points	60–70 points	70–85 points	85–100 points
Pre-University / medical class	0	1 (0.125)	3 (0.375)	4 (0.5)
Academic class / class without specialization	3 (0.1)	4 (0.13)	13 (0.42)	11 (0.35)
$\Sigma = 39; P = 0.5; \mu = 4.9; SE = 1.6; \sigma = 4.6.$				

[Table 5 here]

In this case the correlation value is significant: $r = 0.914$. Taking into account $P = 0.5$, it can be assumed that regardless of the class in which the applicant studied, he/she is able to successfully pass the USE and enter the University without using the services of private teachers.

However, a generalized analysis of the effectiveness of the Unified State Exam among applicants who studied with a tutor and among those who chose not to use private lessons in the implementation of an individual educational strategy gave an obvious negative correlation: $r = -0.149$. Obviously, in case of equal conditions, classes with a tutor give a positive result in any case and regardless of the level of specialization of the class and curriculum.

The analysis of the generalized results showed that during the preparation for entering the university the most common IES of high-schoolers who became first-year students of the I.M. Sechenov First Moscow State Medical University were, respectively:

- Classes with a tutor during 11 grade + training in the class of another (not medical or chemical-biological) profile – 19 people.
- Classes with a tutor during 11 grade + training in the class without any profile – 16 people.
- Classes with a tutor during 11 grade + training in a class with a chemical biological / academic profile – 16 people.

– Training in a class with a chemical-biological / academic profile without the involvement of a tutor – 18 people.

In total, 10 individual educational strategies were identified. For each strategy the average score of the exam was calculated, it is presented in Table 6.

Table 6
The average score on the exam for each type of IES

Individual educational strategy	Number of students	Average exam score
1. Sechenov pre-University (medical class in Moscow school) / tutor for 1 year	11	70–85
2. Class without profile/ tutor for 1 year	16	60–70
3. Academic (chemical-biological class) / tutor for 1 year	16	70–85
4. Other profile class / tutor for 1 year	19	70–85
5. Class without profile / without a tutor	5	70–85
6. Sechenov pre-University (medical class in Moscow school) / without a tutor	8	70–85
7. Other profile class / without a tutor	9	70–85
8. Academic (chemical-biological) class / without a tutor	18	70–85
9. Classes with a tutor for 2 years	26	70–85
10. Classes for half a year / irregular classes / several lessons	31	60–70

[Table 6 here]

The last two educational strategies were deliberately not divided into smaller ones (basing on the profile of the class), as we considered it necessary to compare the effectiveness of classes with a tutor basing on their duration: 2 years (10–11 grades), 1 year (11 grade), as well as irregular / single / semi-annual classes.

The results of the cluster analysis of the generalized data are presented below (Fig. 5).

[Figure 5 here]

Discussion

Indirectly, the high degree of the world community interest in this matter can be shown by a large review that not only gives the results of basic up-to-date data studies, but also suggests a number of

recommendations for building further work [23]. However, most researchers focus on the economic component of the issue, while this study is mainly aimed not at studying the general impact on the economy after implementation of certain components in the educational practice, such as tutoring or preparatory courses, which is an analogue of the educational franchise, but it is aimed at the effectiveness evaluation of these components for each particular applicant. This topic is considered in relation to the practice in Hong Kong [13], Korea and Bangladesh [9, 24, 25]. Some authors reveal the question of economic context even more fully and consider not only a simple individual tutoring as a separate sector of the economy, but also the provision of such educational services through the Internet, which in their opinion increases the possibility of academic mobility without physical movement between different regions [8]. Such a view is fundamental and important; however, particular issues that ultimately interest applicants and their parents often remain unconsidered. In the works devoted to the actual effectiveness of tutoring or other additional educational components the authors do not come to unanimity. Various variants of shadow education in Korea are considered and the author comes to the conclusion that the addition of such strategies gives a small increase in the quality of education. However, the use of additional schools- which is an analogue of additional courses in Russia, led to a more significant increase in academic performance than other forms of additional education. The author explains it by the fact that these additional schools follow the curriculum more strictly, without deviating from the school course. The successes of students in mathematics were compared, 7,000 students were analyzed (12 and respondents considered tutors to be more effective in terms of training than regular school teachers. At the same time, our own data analysis shows a much more diverse picture [2]. In this study, it was demonstrated that classes with a tutor, regardless of the term, but always regular, lead to positive results when entering the university. These data can be explained, among other things, by the high responsibility of the student who regularly works with a tutor. Similar conclusions are supported by colleagues who have studied this issue in Germany [14]. In addition, the vast majority of studies are devoted to training in subjects of humanitarian orientation, as a rule, we are talking about learning English. At the same time, works devoted to the study of other subjects (such as mathematics) still occur. For example, one of the publications considers tutoring in three subjects at once: English, Chinese and math. The author comes to complex conclusions that do not allow giving an unambiguous answer for all categories of applicants, but finds correlations between the success of additional education included in the educational strategy and the quality of general education, comparing urban and rural schools [26]. While working with data and analyzing sources, no strategies similar to ours were found have not found any research on educational strategies in biology similar to ours. It is important to note that there is a distinct interest to this topic nowadays. In particular, the issues of biological education composition in high school and various pedagogical methods aimed at improving student outcomes are discussed [27]. However, the author did not set the task to study educational strategies for university admission, while our study allows us to look at biology teaching in this context. The authors hope that this work will allow more detailed consideration of the issue.

Conclusions

Basing on the questionnaire data analysis it can be asserted that neither classes with a tutor, nor training in specialized classes cannot guarantee high scores of the Unified State Exam and admission to the selected University. Individual educational strategies which include the work with a tutor are only a tool that can work extremely productively only in case of a high level of personal motivation and student's interest. Two questionnaires of our study that show the highest score on the exam and admission to the university on the basis of the olympiad results are an indirect confirmation of this assumption. Respondents also indicated that they were not engaged with a tutor and studied in ordinary secondary schools without any "profile".

At the same time, basing on the results of the study it can also be assumed that at the moment the most optimal is the IES in which regular classes with a tutor supplement the school curriculum in biology, regardless of the presence or absence of an appropriate profile. The generalized data confirm our idea that those graduates who are regularly engaged with a tutor, regardless of the "profile" of the class in high school, receive a relatively high exam score. This fact can serve as a confirmation that classes with a tutor are really an effective tool in the preparation of the applicant.

Interestingly, the implementation of the IES "Sechenov Pre-University (medical class in Moscow school) / classes with a tutor in 11 grade" does not give serious advantages in admission that could be expressed in the expected higher exam scores. This is probably due to the fact that the standard program of preparation for the exam with a tutor is completely overlapped, duplicated by the program of biology in the Pre-University (medical class). As a result, the student studying with a tutor does not receive additional knowledge that could significantly improve the results of the exam.

It is also important to pay attention to the two strategies that have shown minimal results: "Class without profile/ tutor for 1 year" and "Classes for half a year / irregular classes / several lessons". Students who chose these IES showed lower exam results. At the same time, it is necessary to take into account the fact that the last strategy unites all possible options of "class profile", including medical classes in Moscow schools and Sechenov Pre-university.

It can be assumed that the lower results of the exam in the implementation of the strategy "Class without a profile / tutor for 1 year" are explained by the initially low training level of the student at the moment of transition (admission) to the final grade. Further studies that will include an assessment of the current academic level of applicants will allow verifying the correctness of this hypothesis. It is possible that the lower average USE results in the framework of implementation of the IES "Classes for half a year / irregular classes / several lessons" may be associated with a low level of current motivation and interest of students and their parents in the result of the Unified State Exam.

Declarations

Ethics approval and consent to participate. This study was approved by local ethics committee of I.M. Sechenov First Moscow State Medical University.

Consent for publication. Not applicable.

Availability of data and materials. Data will be available on request.

Competing interests. The authors declare that they have no competing interests.

Funding. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Authors' contributions. DB, AG, IB, SL, and TD contributed equally to the experimentation. DB, IB and SL wrote and edited the article. AG and TD equally designed and conducted the experiment. DB and AG studied scientific literature about the topic. All authors read and approved the final manuscript.

Acknowledgements. Not applicable.

References

1. Loyalka PK, Zakharov A. Does shadow education help students prepare for college? *Int J Educ Dev.* 2016;49:22-30.
2. Yung KWH. Comparing the effectiveness of cram school tutors and schoolteachers: A critical analysis of students' perceptions. *Int J Educ Dev.* 2020;72:102141.
3. Bray M. The impact of shadow education on student academic achievement: Why the research is inconclusive and what can be done about it. *Asia Pac Educ Rev.* 2014;15(3):381-389.
4. Burdyak AY. Additional classes in school subjects: motivation and prevalence. *Monitoring of Public Opinion: Economic and Social Changes.* 2015;2(125):96-112.
5. Vasilyeva IV. Problems of development of the system of core and pre-profile education to prepare schoolchildren for professional orientation in the context of new labour market demands. *Adv Modern Sci Educ.* 2016;1(5):18-21.
6. Smyth E. Buying your way into college? Private tuition and the transition to higher education in Ireland. *Oxford Rev Educ.* 2009;35(1):1-22.
7. Gallagher JA. Towards better choices and improved practice: A study of the influences on students' course and college choice in Ireland. *Dissertation, University of Glasgow;* 2017.
8. Ventura A, Jang S. Private tutoring through the internet: Globalization and offshoring. *Asia Pac Educ Rev.* 2010;11(1):59-68.

9. Jung JH, Lee KH. The determinants of private tutoring participation and attendant expenditures in Korea. *Asia Pac Educ Rev.* 2010;11(2):159-168.
10. Nath SR. Private supplementary tutoring among primary students in Bangladesh. *Educ Stud.* 2008;34(1):55-72.
11. Kuan P-Y. Effects of cram schooling on mathematics performance: Evidence from junior high students in Taiwan. *Comp Educ Rev.* 2011;55(3):342-368.
12. Chan VNM. English Private Tutoring in Macao: Perceptions of Senior Secondary Three Students. *ECNU Review of Education.* 2019;2(1):44-63.
13. Kwok LY. A cultural analysis of cram schools in Hong Kong: impact on youth values and implications. *J Youth Stud.* 2009;12(1):104-114.
14. Guill K, Lintorf K. Private tutoring when stakes are high: Insights from the transition from primary to secondary school in Germany. *Int J Educ Dev.* 2019;65:172-182.
15. Buchmann C, Condrón DJ, Roscigno VJ. Shadow education, American style: Test preparation, the SAT and college enrollment. *Soc Forces.* 2010;89(2):435-461.
16. Entrich SR. Shadow education and social inequalities in Japan: Evolving patterns and conceptual implications. Singapore: Springer; 2017.
17. Silova I, Bray M. The hidden marketplace: Private tutoring in former socialist countries. In: Silova I, Bray M, Zabulionis A, Budiene V, Kubánová M, editors. *Education in a hidden marketplace: Monitoring of private tutoring.* Budapest: Education Support Program (ESP) of the Open Society Institute; 2006. p. 71-98.
18. Byun S-Y. Shadow education and academic success in Republic of Korea. In: Park H, Kim K, editors. *Korean education in changing economic and demographic contexts.* Singapore: Springer; 2014. p. 39-58.
19. Nurieva LM, Kiselev SG. Put in a good word about a tutor (again about the effectiveness of tutoring in USE preparation). *Educ Sci.* 2018;20(8):148-163.
20. Naumova AA. The role of tutoring in the modern education system. In: *Russia between modernization and archaization: 1917-2017, Materials of the XX All-Russian Scientific and Practical Conference in 2 volumes, ANOVO Gumanitarnyj Universitet.* Surgut; 2017. p. 385-390.
21. Kostina LA, Milyaeva LM. Socio-psychological adaptation of students to study in medical school. *Fundamental Research.* 2014;1:1-11.
22. Pivovarov YuP, Dagaeva ZA, Sheina NI. The study of the lifestyle of students of medical and biological classes in Moscow. *Public Health and Habitat.* 2015;264(3):13-15.
23. Bray M. Shadow education: Comparative perspectives on the expansion and implications of private supplementary tutoring. *Procedia Soc Behav Sci.* 2013;77:412-420.
24. Hamid MO, Sussex R, Khan A. Private tutoring in English for secondary school students in Bangladesh. *Tesol Q.* 2009;43(2):281-308.

25. Lee CJ, Lee H, Jang H-M. The history of policy responses to shadow education in South Korea: Implications for the next cycle of policy responses. *Asia Pac Educ Rev.* 2010;11(1):97-108.
26. Zhang Y. Does private tutoring improve students' National College Entrance Exam performance? A case study from Jinan, China. *Econ Educ Rev.* 2013;32:1-28.
27. Iancu M. The Scientific Research "Identification of Factors that Influence Pupils' Attitudes and Opinions Regarding the Study of Biological Disciplines". *Procedia Soc Behav Sci.* 2015;180:612-619.

Tables

Table 1. Private lessons with a tutor

	Moscow school	School in another megapolis	Regional center / other town of the Russian Federation	School in the urban-type settlement/ village/ hamlet	Secondary education outside the Russian Federation
Tutor. 10-11 grades.	9	0	14	3	1
Tutor. 11 grade.	30	4	25	1	1
Tutor. 11 grade. Irregularly.	8	0	6	1	1
Tutor. 11 grade. Regularly. Half of a year.	7	0	4	0	0
Tutor. Several lessons.	4	0	1	0	0
No tutor.	15	1	17	3	3

$$\Sigma = 159; P = 0.002; \mu = 5.3; SE = 1.39; \sigma = 7.66$$

Table 2. The dependence of the exam results on the duration of classes with a tutor (the most important pairs)

Private lessons with a tutor	Correlation value (r)
11 grade; six months - 11 grade; regular classes	0.971
11 grade; six months - 10 - 11 grades; regular classes	0.956
11 grade; regular classes - 10 - 11 grades; regular classes	0.932
No tutor Several lessons with a tutor	0.462

Table 3. Duration of classes with a tutor and exam results

	1 - Tutor. 10-11 grades.	Tutor. 11 grade. Regularly.	Tutor. 11 grade. Irregularly.	Tutor. 11 grade. Half of a year.	Tutor. Several lessons.	No tutor
Below 60 points.	0	3	3	1	0	3
60-70 points.	7	20	4	3	2	5
70-85 points.	13	21	6	4	3	16
85-100 points.	7	16	3	3	0	15
100 points (Olympiad).	0	1	0	0	0	0

$$\Sigma = 159; P = 0.01; \mu = 5.3; SE = 1.15; \sigma = 6.33$$

Table 4. Private lessons with a tutor. Different class specializations

	Moscow preuniversity / medical class in Moscow school	Academic biological class	The class of other specialization / class without specialization
Studied with a tutor	25	37	58
Was not engaged with a tutor	8	18	13

$\Sigma = 159; P = 0.6; \mu = 26.5; SE = 7.5; \sigma = 18.4; r = 0.36$

Table 5. Exam results in biology (without the help of a tutor)

	Less than 60 points	60-70 points	70-85 points	85-100 points
Pre-University / medical class	0	1 (0.125)	3 (0.375)	4 (0.5)
Academic class / class without specialization	3 (0.1)	4 (0.13)	13 (0.42)	11 (0.35)

$\Sigma = 39; P = 0.5; \mu = 4.9; SE = 1.6; \sigma = 4.6.$

Table 6. The average score on the exam for each type of IES

Individual educational strategy	Number of students	Average exam score
1. Sechenov pre-University (medical class in Moscow school) / tutor for 1 year	11	70-85
2. Class without profile/ tutor for 1 year	16	60-70
3. Academic (chemical-biological class) / tutor for 1 year	16	70-85
4. Other profile class / tutor for 1 year	19	70-85
5. Class without profile / without a tutor	5	70-85
6. Sechenov pre-University (medical class in Moscow school) / without a tutor	8	70-85
7. Other profile class / without a tutor	9	70-85
8. Academic (chemical-biological) class / without a tutor	18	70-85
9. Classes with a tutor for 2 years	26	70-85
10. Classes for half a year / irregular classes / several lessons	31	60-70

Figures

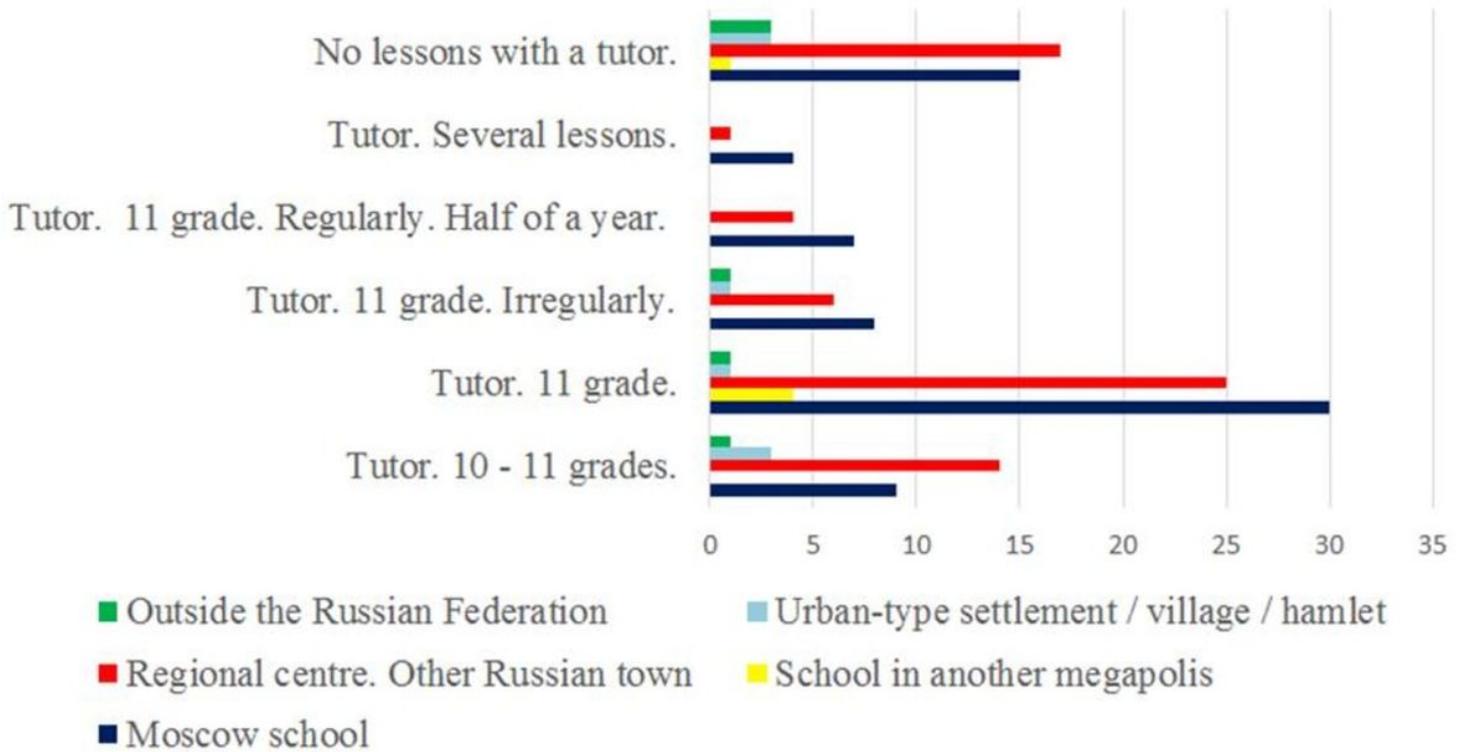


Figure 1

Private lessons with a tutor

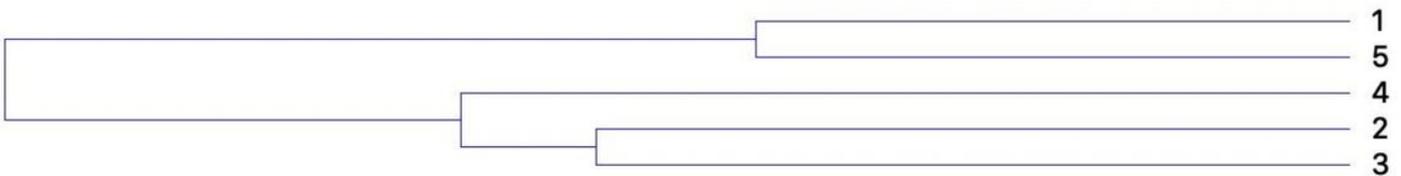


Figure 2

Clusters of USE results depending on the duration of classes with a tutor. Note: 1 – Tutor. 10-11 grades; 2 – Tutor. 11 grade. Regularly; 3 – Tutor. 11 grade. Irregularly; 4 – Tutor. 11 grade / six months; 5 – Tutor. Several lessons.

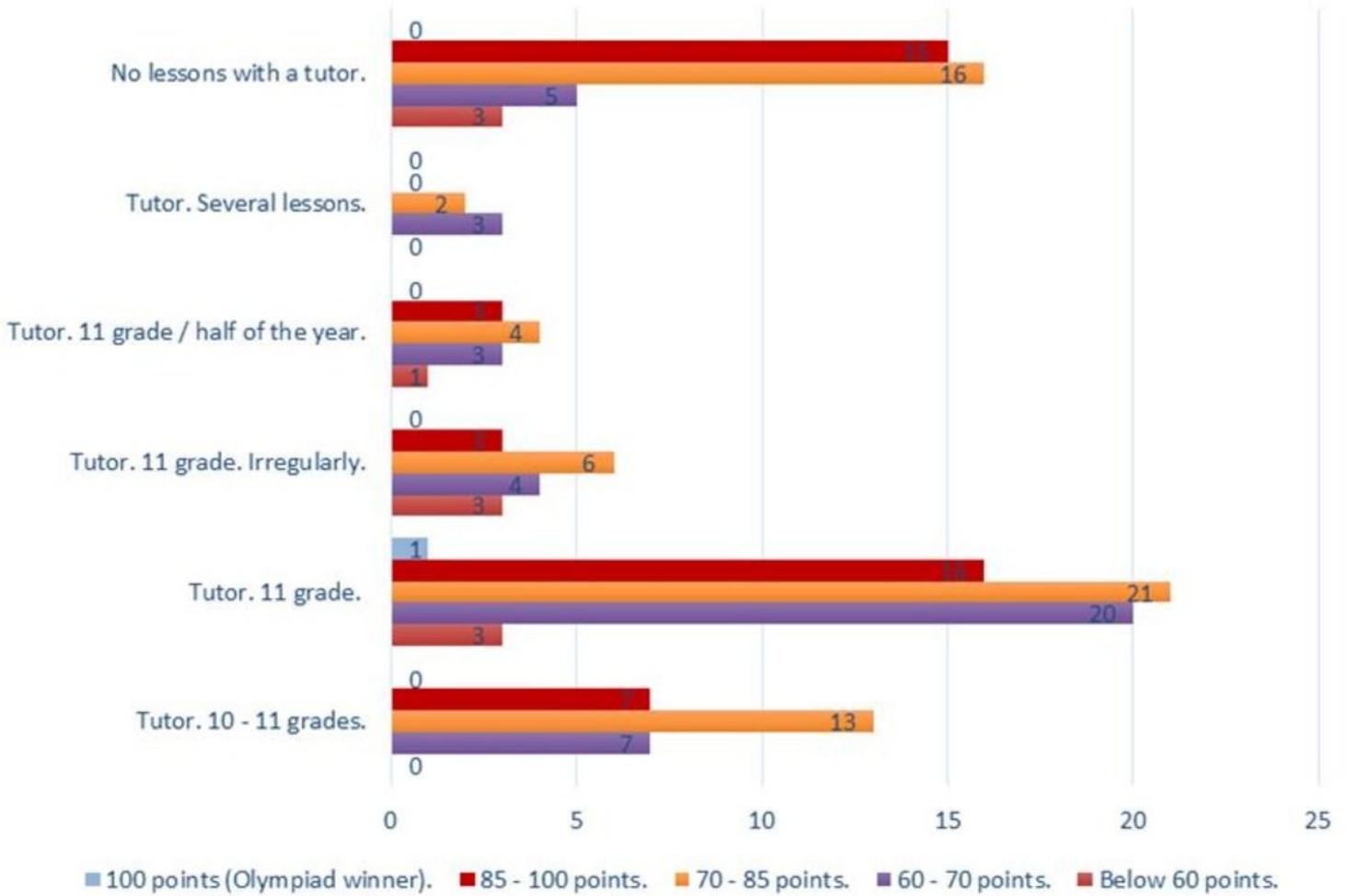


Figure 3

Duration of classes with a tutor and exam results

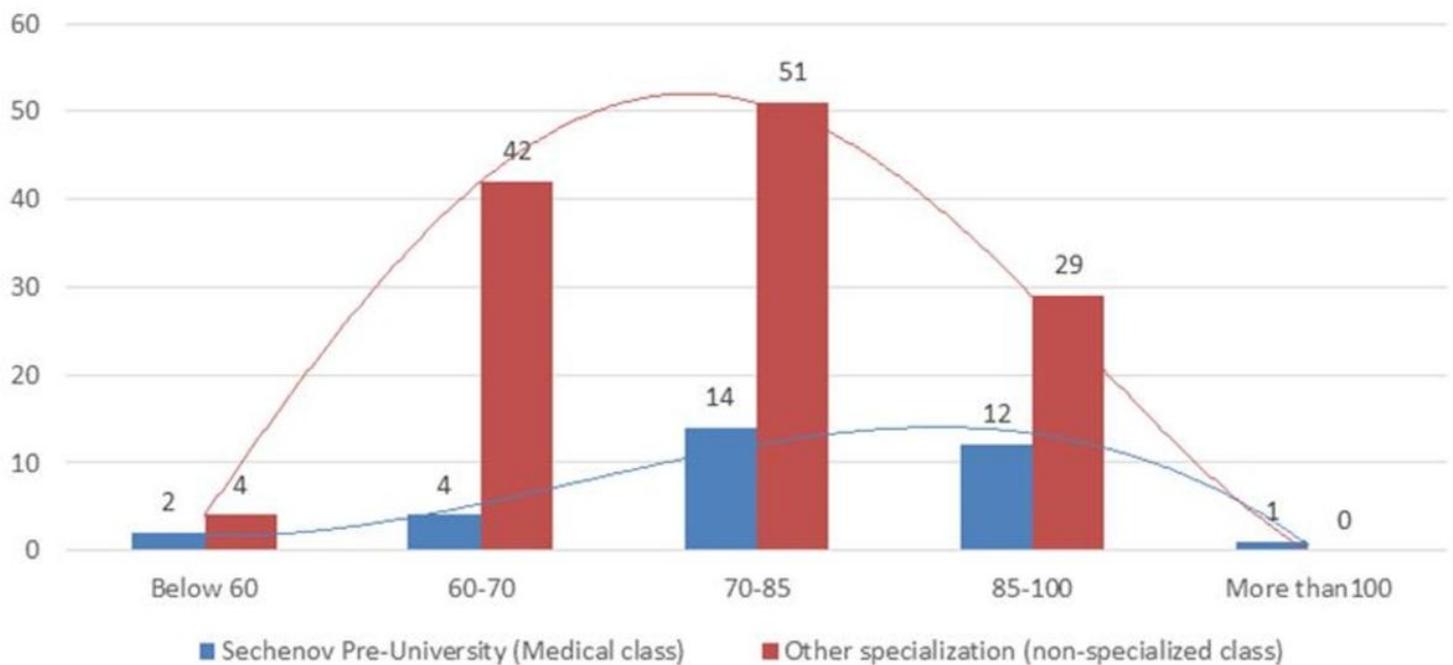


Figure 4

Class specialization and the results of the USE

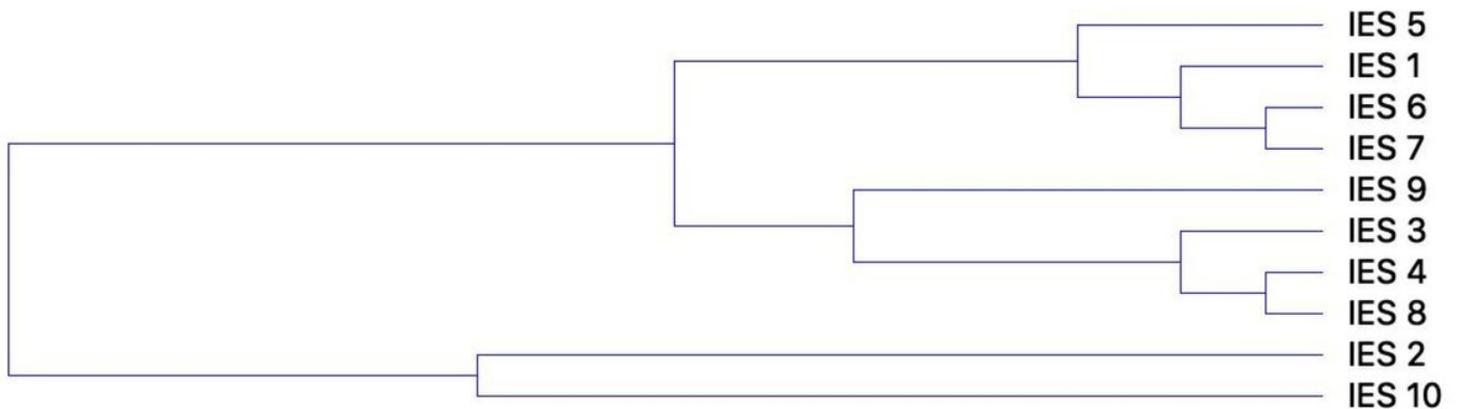


Figure 5

Clusters of individual educational strategies. Note: IES 1 – Sechenov pre-University (medical class in Moscow school) / tutor for 1 year; IES 2 – Class without profile/ tutor for 1 year; IES 3 – Academic (chemical-biological class) / tutor for 1 year; IES 4 – Class of other profile / tutor for 1 year; IES 5 – Class without profile / without tutor; IES 6 – Moscow pre-University (medical class in Moscow school) / without tutor; IES 7 – Other profile class / without a tutor; IES 8 – Academic (chemical-biological) class / without tutor; IES 9 – Tutoring for 2 years; IES 10 – Classes for half a year / irregular classes / several lessons