Is the Academic Performance of Schoolchildren Linked to the Expectations of Their Teachers? *Results of an Experimental Study*

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This article was submitted to the Editorial Board in November 2021

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Abstract

Teachers' expectations may affect the academic performance of their pupils, leading to the effect of "self-fulfilling prophecies." Teachers form their expectations about the academic performance of their pupils based on the information they possess about the latter. The present study tested a hypothesis about a correlation between the teacher's disposal of information about the pupil's ranking on an initial diagnostic test at the beginning of the first grade and the pupil's academic performance at the end of the first grade. It also tested the hypothesis that the teacher's awareness of the pupil's ranking can affect their expectations about the level of the pupil's cognitive skills. In this large-scale cluster randomized controlled trial study, 4,460 first-grade students from 188 schools in a Russian region participated. The schools were divided into the experimental and control groups randomly. The teachers in the control group received information about the basic skills of their pupils. In contrast, experimental group teachers additionally received information about their pupils' ranking based on a combination of indicators of their cognitive (basic reading and math) and non-cognitive (personal and socio-emotional) skills. The results showed that there are no differences in students' academic achievements between the groups.

Keywords

teacher expectations, primary school, START, cognitive skills, non-cognitive skills.

For citing

Yusupova E.M., Kapuza A.V., Kardanova E.Yu. (2022) Svyazany li akademicheskie dostizheniya uchashchikhsya s ozhidaniyami ikh uchiteley. Rezul'taty eksperimental'nogo issledovaniya [Is the Academic Performance of Schoolchildren Linked to the Expectations of Their Teachers? Results of an Experimental Study]. Voprosy obrazovaniya / Educational Studies Moscow, no 1, pp. 189–217. https://doi.org/10.17323/1814-9545-2022-1-189-217

The teacher-student relationship is an important determinant of the educational process. Several studies show that the nature of this relationship is significantly associated with students' engagement in learning activities [Martin, Collie, 2019], academic achievements [Košir, Tement, 2013], and behavior problems [Lei et al., 2016]. Children do better in school and feel more connected to it when they have teachers they find friendly and supportive [Polivanova, Rivina, 2009; Sobkin, Fomichenko, 2015; Davis, 2003]. In primary school, a positive teacher-student relationship is especially important: the results of longitudinal studies showed that the relationship between teachers and first-graders is associated with the children's psychosocial adjustment in primary school [Buyse et al., 2009].

The nature of the teacher-student relationship is determined by a variety of factors, including such an important one as teacher expectations, i.e. "inferences that teachers make about the future behavior or academic achievement of their students based on what they know about them" [Good, 1987]. Teachers form their expectations of students' academic achievement based on the information they possess about the children, namely about their academic performance, behavior, motivation and engagement, gender, family socioeconomic status, etc. [Rubie-Davies, 2004; Good, Brophy, 2008]. Teachers' expectations can also be influenced by their beliefs about students' abilities and needs that the teachers have developed over many years in school [Rubie-Davies, 2004; Turner, Christensen, Meyer, 2009].

Teachers' expectations may affect students' academic achievement, becoming a self-fulfilling prophecy [Rosenthal, Jacobson, 1968]. Several studies have found that teachers' expectations of student success are positively associated with students' high academic performance (Pygmalion effect) [Wang, Rubie-Davies, and Meissel, 2018; Jamil, Larsen, and Hamre, 2018; Rosenthal and Jacobson, 1968], and the strength of the association may increase as students move from year to year [Jamil, Larsen, and Hamre, 2018]. At the same time, teachers' expectations of students' failure that the teachers explicitly demonstrate can lead to the students' poorer academic performance (Golem effect) [Babad, Inbar, Rosenthal, 1982; Reynolds, 2007].

Teacher expectations may increase the discrepancy in student achievement. For example, the achievement gap between groups of students formed by their family's socio-economic status is more likely to emerge if the teachers exaggerate the differences between the groups [Timmermans, Kuyper, van der Werf, 2015]. It has been found that in classes with a high level of student differentiation, teacher expectations account for 14% of the achievement gap at the end of the school year, while in classes with a low level of student differentiation it is only 3% [Brattesani, Weinstein, Marshall, 1984].

The effect of teachers' expectations on students' academic achievement is stronger for some students than for others. These differences can be related to both teacher characteristics, such as teachers' qualifications, belief systems and practices used [Brattesani, Weinstein, Marshall, 1984; Timmermans, Kuyper, van der Werf, 2015], and individual student characteristics [Babad, 1990]. Most studies of the relationship between teacher expectations and student academic achievement or the impact of teacher expectations on student achievement only control for such individual student characteristics as academic performance, behavior, family socio-economic status, learning difficulties, and ethnicity. Moreover, only one of these characteristics is usually considered. There is almost no research on the relationship between teacher expectations and academic performance of children who differ in more than one individual characteristic, particularly in the combination of indicators of their cognitive and non-cognitive (personal and social-emotional) skills.

In studies conducted in primary school, it is especially important to control not only for cognitive skills but also for non-cognitive ones, as their development level at the beginning of schooling is a strong predictor of future success both in school and in life [Kautz et al., 2014]. Moreover, the beginning of schooling is a critical period in the life of schoolchildren: their adaptation to school largely determines their academic achievement later on in school life [Margetts, 2009; Domitrovich et al., 2017; Zuckerman, Polivanova, 2012].

The levels of cognitive and non-cognitive skills in children differ, and a high level of cognitive skills does not indicate strong non-cognitive skills, since these characteristics are conceptually independent of each other [Duckworth, Yeager, 2015]. The existence of student groups differing in the levels of cognitive and non-cognitive skills has been empirically confirmed [Kardanova et al., 2018; Orel et al., 2018; Südkamp, Praetorius, Spinath, 2018].

Teachers are inclined to group students based on their cognitive and social-emotional skills. However, groups of students identified by teachers are consistent: they are characterized by low, average, or above-average levels of both cognitive and non-cognitive (social-emotional) characteristics. In other words, teachers perceive the cognitive and non-cognitive characteristics of each student as congruent and disregard possible discrepancies in student profiles, while in reality there are both consistent and inconsistent groups [Südkamp, Praetorius, Spinath, 2017].

If teachers have some information about different groups of students, it can affect their expectations of students' skill levels and academic performance. The theoretical and empirical research available so far (e.g., [Rubbie-Davies, 2004; Good, Brophy, 2008]) identifies the following main stages of the teacher expectation effect process:

1) teachers form expectations of their students' future achievements based on the information available to them. Underlying these expectations are teachers' conscious beliefs about principles of teaching and patterns of child development as well as unconscious attitudes, including social stereotypes;
2) teachers convey their expectations to students through their behavior and the different learning opportunities they provide;
3) students perceive and interpret teachers' behavior;
4) teachers' differential treatment of students and students' perceptions and interpretations of it affect student academic achievement.

The purpose of this study is to investigate the relationship between teachers' knowledge of the existence of different student groups in the classroom at the beginning of 1st grade, identified based on their cognitive and non-cognitive skills, and teachers' expectations of these students. Furthermore, the study investigates whether teachers' knowledge of the student groups affects these students' academic performance at the end of the academic year.

This study answers the following research questions.

1. Is the teacher's knowledge of the student groups at the beginning of 1st grade related to student academic achievement at the end of the academic year?
2. Is the teacher's knowledge of which group the student belongs to at the beginning of 1st grade related to the student's academic achievement at the end of the academic year?
3. Is the teacher's knowledge of which group the student belongs to related to the teacher's expectations about the student's level of cognitive skills at the end of the academic year?

1. Methodology

1.1. Measurement Instrument

We used START to assess children's cognitive and non-cognitive skills at the beginning and the end of 1st grade. START is an instrument for diagnosing children's levels of cognitive and non-cognitive skills on entry to school and their individual progress made in the first year, developed at the Institute of Education of the National Research University Higher School of Economics (HSE University) [Kardanova et al., 2018]. The START instrument has appropriate psychometric properties and high validity [Kardanova et al., 2018; Brun et al., 2016; Orel et al., 2018].

The instrument is used for a comprehensive assessment of children's development. It assesses not only cognitive but also social and emotional skills. The assessment procedure is an individual computerized, fully automated, game-based testing using an adaptive algorithm that allows children to solve tasks of the appropriate

level of difficulty. The assessment is assisted by an interviewer — usually a teacher who has received specific instructions.

The set of tasks used to diagnose children's cognitive skills consists of several blocks, including blocks with mathematics and reading tasks[1]. Quite a few studies have shown the predictive role of early reading and mathematics skills for later school success [Müller, Brady, 2001; Duncan et al., 2007; Manfra et al., 2017; Jordan et al., 2009].

The mathematics block includes five types of tasks:

- geometric sequences (identifying and continuing them);
- arithmetic sequences (identifying and continuing them);
- number line (navigating a number line from 0 to 100);
- the concept of part and whole (understanding the concepts of half and quarter);
- calculation skills (sums involving addition and subtraction with and without pictures, with and without crossing 10; solving word problems).

The reading block includes four types of tasks:

- letter knowledge;
- reading words (recognizing the graphic representation of words);
- reading a short story (decoding a text);
- reading comprehension (reading a text with "traps", where a child has to choose the most appropriate word from the three options).

In addition, personal and social-emotional skills were assessed, the role and impact of which on various aspects of children's lives had been confirmed by numerous studies [OECD, 2015; Durlak et al., 2011; Domitrovich et al., 2017]. These skills were assessed using the PSED (Personal Social and Emotional Development) questionnaire, which is part of the START tool. The questionnaire is completed by a teacher. The teacher assesses each child in his or her class on a five-point scale based on a set of questions. Each question is accompanied by a detailed description of a child's behavior that is easy for the teacher to observe in the school setting. All questions are grouped into two scales: classroom behavior and communication. The full description of the PSED questionnaire and its scales can be found in [Orel, Ponomareva, 2018; Brun et al., 2016].

The assessment using the START tool was conducted at the beginning and the end of the 1st grade to assess children's initial level

[1] For a detailed description of the instrument, see [Kardanova et al., 2018].

of cognitive and non-cognitive skills and their individual progress. As part of the study, the contextual information was also collected using teacher and parent questionnaires. At the end of each stage, teachers, school administration, and parents received feedback.

1.2. Design of the study

To find answers to the research questions, we organized and conducted a cluster randomized controlled trial study in 195 schools in one Russian region. The study was approved by the Ethics Committee of the HSE University.

Experimental studies involving the intentional change of teacher expectations can be classified according to the interventions types, e.g. providing teachers with false information [Rosenthal, Jacobson, 1968], working with teachers to change their behavior [Rubie-Davies et al, 2015], raising teachers' awareness of expectancy effects [Timperley, Phillips, 2003], addressing the beliefs underlying teacher expectations [Reiter, Davis, 2011], using special scholarship programmes [Jones, Miron, Kelaher-Young, 2012]. Several types of interventions can be used in one study. The success of interventions is usually assessed using students' academic performance and/or indicators of teacher expectations, which are defined as teachers' estimates of students' academic potential [De Boer, Timmermans, van der Werf, 2018].

The intervention that was used in this study involved raising teachers' awareness of what groups of children were there in the class and providing guidance on how to work with each of these groups. Based on the theoretical and experimental data, we hypothesized that after receiving additional information about the group to which a student belongs, the teacher may adjust their opinion about the student and, consequently, their expectations.

The experiment was performed in four stages:

- in October 2019, the baseline survey was conducted, including the assessment of first-graders' cognitive (mathematics and reading) and non-cognitive (personality and social-emotional) skills and a survey of teachers and parents;
- in November 2019, the schools participating in the study were randomly assigned to a control or an experimental group;
- in November–December 2019, teachers were provided with the children's assessment results, whereby teachers from the experimental group received additional information on the groups present in the class; webinars on how to work with the reports were conducted;
- the follow-up assessment of the students' skills as well as the additional teacher survey were initially planned for May 2020 but were postponed to September 2020 due to the COVID-19 pandemic.

1.2.1. Baseline survey

The baseline survey consisted of three parts: testing all students using the START instrument; completion by all teachers of the PSED questionnaire and a teacher questionnaire with questions on their educational level, work experience, and class size; and completion of a questionnaire by parents of pupils (questions about their children's age and gender and the cultural capital of the family).

The teacher survey also measured the extent to which teachers agreed with common perceptions of the factors important for academic and professional success. For this purpose, we used the questions about students' field-specific abilities formulated by S.-J. Leslie and his colleagues [Leslie et al., 2015] based on C. Dweck's theory of intelligence [Dweck, 1999]. The questions had been translated, modified, and localized by the developers of the START tool for the fields of mathematics and humanities. The teachers were asked to specify to what extent they agreed that success in these fields depended more on students' hard work, effort, and motivation than on their innate talent and abilities. The questionnaire included eight statements. The teachers rated their level of agreement or disagreement on a Likert scale.

The responses to the teacher beliefs questionnaire were scaled using the rating scale model [Wright, Masters, 1982]. The construct underlying the scale was essentially unidimensional. The classical reliability (Cronbach's alpha) was 0.89. A high score on the scale indicated that the teacher believed that success in mathematics and the humanities was more likely to be determined by students' hard work, effort, and motivation than their innate talent or special abilities.

Based on the children's test results and the PSED questionnaire completed by the teachers, scales for the levels of cognitive and non-cognitive skills were constructed using the methods of item response theory (IRT). Children's raw test scores were converted to ability scores on two cognitive scales — for mathematics and reading — using the one-parameter dichotomous Rasch model [Wright, Stone, 1979]. To obtain scores on the behavior and communication scales, the rating scale model [Wright, Masters, 1982] was applied. The scores had good psychometric properties. The constructs underlying the four scales (for mathematics, reading, behavior, and communication) were essentially unidimensional. All test items displayed a good fit to the model. The measurement reliability ranged from 0.79 to 0.98. The test items showed no floor or ceiling effects.

Thus, based on the baseline survey results, each student's scores were calculated on the four scales: mathematics, reading, behavior, and communication. The scores were converted to a standardized scale with a mean of 50 and a standard deviation of 10. After that, the children's average scores for cognitive and non-cognitive skills were calculated. As a result, each child was characterized

by two indicators on a 100-point scale describing his or her levels of cognitive and non-cognitive skills, respectively.

Based on the test results, first-graders were divided into 4 groups:

1) schoolchildren scoring over 50 for both cognitive and non-cognitive skills — children with advanced cognitive and mature non-cognitive skills (group 1);
2) schoolchildren scoring over 50 for cognitive and lower than 50 for non-cognitive skills — children with advanced cognitive and developing non-cognitive skills (group 2);
3) schoolchildren scoring lower than 50 for cognitive and over 50 for non-cognitive skills — children with basic cognitive and mature non-cognitive skills (group 3);
4) schoolchildren scoring lower than 50 for both cognitive and non-cognitive skills — children with basic cognitive and developing non-cognitive skills (group 4).

The use of the words “advanced”, “basic”, “mature”, and “developing” had been discussed with the Russian experts, so that the teachers could easily interpret these words.

1.2.1.1. Sampling in the first stage of the study

In the first stage, 5,392 students from 195 schools were tested. Only the students whose parents had given their informed consent participated in the study. In the vast majority of schools, one class and one teacher were selected to participate in the study. In some schools, however, more than one class, each with one teacher, was involved. The invited schoolchildren and teachers represented a total of 288 first-year classrooms. Of the entire sample, 211 (3.9%) students did not complete all stages of the testing and therefore did not participate in the experiment. A total of 5,181 schoolchildren were allocated to groups.

1.2.1.2 Randomisation

First, the sample was stratified. Each stratum (or block) out of 49 contained 4 schools with similar average scores in mathematics. Second, the schools within each stratum were randomly assigned to two groups with different experimental conditions. The control group included 97 schools and the experimental group consisted of 98 schools.

1.2.1.3. Balance testing

Appendix 1 shows the results of the balance test, i.e. the test of the significance of the differences between the control and experimental groups before the start of the experiment. Using regression

analysis, a total of 10 comparisons with different dependent variables were performed. As the independent variable, we used the allocation to the experimental group, while controlling for strata. When the variables measured at the student level were involved, we used the clustering of residuals at the school level as the dependent variables. None of the comparisons showed a statistically significant result at the 0.05 level. Thus, the balance between the control and experimental groups had been achieved and they were not statistically significantly different from each other in the characteristics important to the experiment.

1.2.2. Intervention: types of reports

Based on the results of the diagnostic assessment, the following two types of reports were developed:

1) standard reports on the results of the first stage of the START diagnostic assessment, including aggregated classroom results as well as individual student results for all four indicators on a 100-point scale;
2) an additional report on which group each student belongs to, which provided a meaningful description of each group, its potential problem areas, and recommendations for teachers on how to work with children from different groups.

Teachers from the control group schools received standard reports, while teachers from the experimental group schools also received additional reports.

Control group teachers received the same information about the test scores of their students as teachers from the experimental group but did not receive the information about the student groups. Thus, any potential differences in student performance in the experimental and control groups could be a consequence of the fact that the experimental group teachers had been given an additional report.

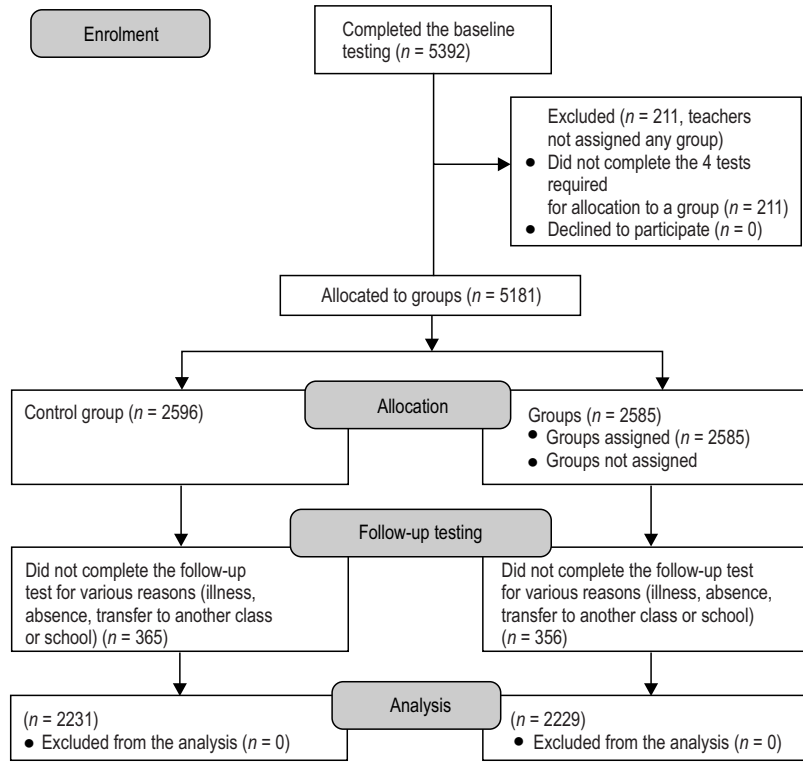
1.2.3. Follow-up survey

In September 2020, students did the final (follow-up) test, and an additional survey of the students and teachers was conducted. All students were tested again using the START tool. To determine whether the teachers' opinions and, consequently, their expectations had been affected by receiving / not receiving the information about groups of students, in the follow-up survey teachers were additionally asked to comment on each student's cognitive skills at the beginning of the academic year (retrospective evaluation).

1.2.3.1. Sampling in the second stage of the study

The final analysis used data from 4,460 students representing 188 schools (the average age of children was 7.4 years, and 50.1% of the sample were female students). The attrition rate after the follow-up testing was 13.9% (14% of the students in the control group and 13.7% of the students in the experimental group did not complete the follow-up test for various reasons). Figure 1 shows the general description of the study sample. Additional analysis was performed to establish whether the attrition was random. For this purpose, the variable that indicates missing data was constructed, taking the value 1 if a student was included in the experiment but did not complete the follow-up test. A regression model was constructed for each student-level characteristic as the dependent variable, and "allocation to the experimental group", "skipped the follow-up test", and the interaction between the two variables as independent variables, while also controlling for strata and clustering at the school level (Table 1). The results showed that the attrition patterns for the characteristics in question were not statistically significantly different between the experimental and control groups. Consequently, there was no attrition bias.

Figure 1. **The CONSORT[2] flow diagram of sampling**



[2] http://www.consort-statement.org/consort-statement/flow-diagram

Table 1. **Analysis of Attrition Patterns during the Follow-Up Testing**

	Mathematics score in the baseline test	Reading score in the baseline test	Behavior score in the baseline test	Communication score in the baseline test	Male
	(1)	(2)	(3)	(4)	(5)
Allocation to the experimental group	0.164	0.524	–0.338	0.503	–0.009
	(0.154)	(0.445)	(0.529)	(0.681)	(0.012)
Skipped the follow-up test	–1.803**	–2.977***	–3.267***	–2.192***	0.035
	(0.705)	(0.969)	(0.798)	(0.810)	(0.029)
Experimental group * Skip	–0.894	–0.782	–0.301	–0.596	–0.023
	(0.935)	(1.172)	(1.121)	(1.164)	(0.039)
Constant	35.12***	38.84***	46.37***	46.20***	0.797***
	(0.781)	(3.269)	(3.916)	(3.572)	(0.121)
Number of observations	5181	5181	5181	5181	5181
R^2	0.244	0.276	0.073	0.076	0.015

Note. Standard errors are given in parentheses.

***$p < .01$, **$p < .05$, *$p < .10$.

1.3. Statistical approach

The analyzed data have a hierarchical structure: students are nested within classes and classes are nested within schools. To answer the first and second research questions, a series of multilevel regressions were performed. This method is suitable for analyzing data with a hierarchical structure [Hox, 2002; Raudenbush, Bryk, 2002]. A two-level regression (students at level one, classes at level two) was used in the analysis since in many schools only one class was included in the sample (75%).

To answer the third research question, a series of multilevel logistic regressions were performed [Sommet, Morselli, 2017]. Two two-level logistic models were constructed to test whether there was a relationship between the teacher's knowledge of the student groups in the classroom and which group each student belonged to and the teacher's opinion about the cognitive skills of the students. R-squared was calculated using the formula proposed by T. Snijders and R. Bosker [Snijders, Bosker, 2012].

1.4. Variables and covariates

Dependent variables:

- the results of the START test in mathematics obtained in the follow-up survey were used as the *academic achievement* variable;

- teachers' expectations regarding the level of students' cognitive skills at the beginning of the 1st grade. A binary variable takes the value of 0 (basic level) or 1 (advanced level).

Predictors:

- the dichotomous variable *knowledge of student groups* denoted the use of intervention in the class, namely the provision of the additional report to the teacher. This variable takes the following values: 0 — if the teacher did not receive the additional report (teacher in the control group), 1 — if the teacher received the additional report (teacher in the experimental group);
- the variable *the teacher's knowledge of which group the student belongs to* takes one of the five values: 0 — if the teacher did not receive the additional report; 1, 2, 3, 4 — if the teacher received the additional report and the student belongs to group 1, 2, 3 or 4 respectively.

As covariates in the regression models, we used the class-level variables (class size, teaching experience, teacher education, teacher belief scale scores), as well as the student-level variables (gender and scores at the beginning of the school year on all four scales: mathematics, reading, behavior, and communication). The variables *class size* and *teaching experience* were centered on the mean.

The statistical analysis was conducted using the STATA software (2016)[3].

2. Results

2.1. Descriptive statistics

Tables 2 to 5 show descriptive statistics of the groups of study participants.

Table 2. **General Descriptive Statistics**

Variable	Mean	Standard deviation	Min.	Max.
Mathematics (baseline assessment)	50.26	9.81	11.69	93.91
Reading (baseline assessment)	50.40	9.70	25.21	68.17
Behavior (baseline assessment)	50.50	9.77	23.91	69.39
Communication (baseline assessment)	50.40	9.86	17.17	73.88
Mathematics (follow-up assessment)	60.98	11.21	25.89	94.56
Teaching experience	21.14	11.45	0	50

[3] StataCorp. (2021) Stata Statistical Software (Release 16) [Computer software]. StataCorp LLC.

Variable	Mean	Standard deviation	Min.	Max.
Class size	25.29	7.07	1	35
Teacher beliefs (logits)	0.19	2.09	–4.45	6.42

Table 3. **Prevalence of Teachers with Higher Education**

	Frequency	Percentage
Higher education	3705	83.33
No higher education	741	16.67
Total	4446	100

Table 4. **Student Groups**

	Control group	Experimental group	Total
Group 1	728 (16.32%)	717 (16.08%)	1445 (32.40%)
Group 2	385 (8.63%)	437 (9.80%)	822 (18.43%)
Group 3	422 (9.46%)	382 (8.57%)	804 (18.03%)
Group 4	696 (15.61%)	693 (15.54%)	1389 (31.14%)
Total	2231 (50.02%)	2229 (49.98%)	4460 (100%)

Table 5. **Gender Distribution in the Control and Experimental Groups**

	Control group	Experimental group	Total
Female	1127 (25.27%)	1145 (25.61%)	2269 (50.87%)
Male	1104 (24.75%)	1087 (24.37%)	2191 (49.13%)

2.2. Research question 1. Is the teacher's knowledge of the student groups at the beginning of the 1st grade related to student academic achievement at the end of the academic year?

Table 6 shows the results of the analysis of the relationship between the teacher's knowledge of the student groups at the beginning of the 1st grade and student achievement in mathematics according to the final (follow-up) assessment (an intercept-only model and a model with a predictor).

In the intercept-only model for the final mathematics test, the intraclass correlation coefficient is 0.25. This means that 25% of the variance in children's results is explained by the grouping of students by class. Model 1 with a predictor and covariates shows no significant effect of the teacher's knowledge of the student groups on the students' performance in mathematics, i.e., the provision of the additional report to the teacher did not have a significant effect on the children's mathematics results in the final test. At the same time, the children's mathematics performance in the follow-up assessment is significantly associated with their scores in the baseline testing, as well as with their gender and class size. The coefficients of the other variables are insignificant.

Table 6. **Results of the Multilevel Regression Analysis of the Relationship between the Teacher's Knowledge of the Student Groups at the Beginning of the 1st grade and the Students' Mathematics Performance in the Follow-up**

Predictors	Intercept-only model B (SE)	Model 1 B (SE)
Mixed effects		
Student-level variables		
(Intercept)	60.78*** (0.38)	61.99*** (0.70)
Mathematics (baseline assessment)		7.13*** (0.14)
Reading (baseline assessment)		0.91*** (0.15)
Behavior (baseline assessment)		0.62*** (0.14)
Communication (baseline assessment)		0.90*** (0.14)
Gender (1 — female)		–2.05*** (0.22)
Class-level variables		
Teacher's knowledge of the student groups (1 — teacher received the additional report)		0.19 (0.54)
Teacher education (1 — higher education)		–0.09 (0.69)
Teaching experience		0.02 (0.02)
Class size		–0.08* (0.03)
Teacher beliefs		0.14 (0.26)
Random effects		
Level 1 variance	96.57	42.46
Level 2 variance	32.44	15.72
–2*log-likelihood	33515.34	–29777.31
ICC	0.25	0.27
R^2 (level 1)		0.55
R^2 (level 2)		0.53

***p < .001, **p < .01, *p < .05.

Research question 2. Is the teacher's knowledge of which group the student belongs to at the beginning of the 1st grade related to the student's academic achievement at the end of the academic year?

Table 7 shows the results of the analysis of the relationship between the teacher's knowledge of which group the student belongs to and the student's mathematics performance in the follow-up assessment. Model 2 with a predictor and covariates shows no significant effect of the provision of the additional report to the teacher containing the information on the children's mathematics performance.

Table 7. **Results of the Multilevel Regression Analysis of the Relationship between the Teacher's Knowledge of which Group the Student Belongs to and the Student's Mathematics Performance in the Follow-up Assessment**

Predictors	Model 2 B (SE)
Mixed effects	
Student-level variables	
(Intercept)	61.99*** (0.70)
Mathematics (baseline assessment)	7.13*** (0.13)
Reading (baseline assessment)	0.92*** (0.15)
Behavior (baseline assessment)	0.59*** (0.15)
Communication (baseline assessment)	0.89*** (0.16)
Gender (1 — female)	–2.05*** (0.22)
Class-level variables	
Group 1 (the teacher received information about the student's group and the student falls into group 1)	0.29 (0.60)
Group 2 (the teacher received information about the student's group and the student falls into group 2)	0.08 (0.64)
Group 3 (the teacher received information about the student's group and the student falls into group 3)	0.32 (0.65)
Group 4 (the teacher received information about the student's group and the student falls into group 4)	0.07 (0.60)
Teacher education (1 — higher education)	–0.09 (0.69)
Teaching experience	0.02 (0.02)
Class size	–0.08* (0.03)
Teacher beliefs	0.13 (0.26)
Random effects	
Level 1 variance	42.46
Level 2 variance	15.71
–2*log-likelihood	–29776.88
ICC	0.27
R^2 (level 1)	0.55
R^2 (level 2)	0.53

Note. Group 0 (the teacher did not receive the additional report) is the reference group.

***p < .001, **p < .01, *p < .05.

2.4. Research question 3. Is the teacher's knowledge of which group the student belongs to related to the teacher's expectations of the student's level of cognitive skills at the end of the academic year?

Table 8 shows the results of a series of multilevel logistic regressions — an intercept-only model and two models with covariates. In the intercept-only model, the intraclass correlation coefficient equals 0.18, meaning that 18% of the variance is explained by differences between classes. The results obtained suggest that neither teachers' knowledge of the student groups in the classroom nor teachers' knowledge of which group each student belongs to is related to the teachers' expectations of the students' cognitive skills.

Table 8. **Results of a Series of Multilevel Logistic Regressions**

Predictors	Intercept-only model B (SE)	Model 3 B (SE)	Model 4 B (SE)
Mixed effects			
Student-level variables			
(Intercept)	–0.92*** (0.06)	–1.47*** (0.31)	–1.48*** (0.31)
Mathematics (baseline assessment)		0.75*** (0.06)	0.75*** (0.07)
Reading (baseline assessment)		0.91*** (0.07)	0.90*** (0.08)
Behavior (baseline assessment)		0.58*** (0.06)	0.62*** (0.07)
Communication (baseline assessment)		0.70*** (0.06)	0.72*** (0.07)
Gender (1 — female)		–0.12 (0.10)	–0.12 (0.10)
Class-level variables			
Teacher's knowledge of the student groups (1 — teacher received the additional report)		0.05 (0.24)	
Group 1 (the teacher received information about the student's group and the student belongs to group 1)			–0.02 (0.26)
Group 2 (the teacher received information about the student's group and the student belongs to group 2)			0.24 (0.28)
Group 3 (the teacher received information about the student's group and the student belongs to group 3)			0.01 (0.28)
Group 4 (the teacher received information about the student's group and the student belongs to group 4)			0.05 (0.29)
Teacher education (1 — higher education)		0.03 (0.30)	0.03 (0.31)
Teaching experience		0.00 (0.01)	0.00 (0.01)
Class size		–0.02 (0.01)	–0.02 (0.01)
Teacher beliefs		0.15 (0.11)	0.15 (0.11)
Random effects			

Predictors	Intercept-only model B (SE)	Model 3 B (SE)	Model 4 B (SE)
Level 2 variance	0.72	2.83	2.83
-2*log-likelihood	5349.25	3824.43	3822.55
ICC	0.18	0.47	0.47

Note. Group 0 (the teacher did not receive the additional report) is the reference group.

***p < .001, ** p < .01, *p < .05.

Conclusion

Since R. Rosenthal and L. Jacobson [Rosenthal, Jacobson, 1968] published their famous study, teachers' expectations have been the focus of much research. Nevertheless, there are a lot of unexplored issues in this research field. For instance, the research on factors influencing teachers' expectations has paid little attention to students' social-emotional skills, behavior, and engagement in the classroom [Wang, Rubie-Davies, Meissel, 2018]. In addition, there is little evidence on what impact teachers' expectations have on students' academic achievements depending on their cognitive and social-emotional skills [Abdurakhmanova, 2020]. There is remarkably little experimental research on how to raise teachers' expectations and prevent negative consequences of teacher bias on students' academic achievement [De Boer, Timmermans, van der Werf, 2018].

The present study has several distinctive features. First, we considered groups of students that differed in two characteristics — the levels of the students' cognitive and non-cognitive skills — and tried to find out whether they differed in academic achievement depending on the teachers' knowledge of the students' abilities. Previous studies on the relationship between teachers' expectations and students' academic achievements have mainly looked at such characteristics as students' gender, family socio-economic status, academic performance, behavior, and ethnicity [Wang, Rubie-Davies, Meissel, 2018; De Boer, Timmermans, van der Werf, 2018]. Moreover, only one of the students' characteristics was usually considered.

Second, in this study, we raised the experimental group teachers' awareness of the children's individual characteristics and advised the teachers on strategies for interacting with children from different groups. We hypothesized that the availability of information about student groups and recommendations for dealing with children from different groups might change teachers' expectations and, consequently, their behavior, and these changes might affect the academic performance of first-graders by the end of the school year. There is evidence in previous experimental studies that students' academic achievements can be improved using interven-

tions that change teachers' expectations [De Boer, Timmermans, van der Werf, 2018].

Third, an additional qualitative study was conducted to enable advanced interpretation of the results obtained. We interviewed 10 teachers (mean teaching experience — 22.2 years, standard deviation — 7.7) in both groups (5 teachers in the control group, 5 in the experimental group) to find out how they had actually used the reports provided to them. We asked the teachers how they had used the results of the initial diagnostic test in their interaction with the children, whether they had changed their behavior and work methods based on these results, and which information about students in the reports had been most important to them. Teachers were also asked to describe their expectations of students' academic achievement and explain how they chose student characteristics to form their expectations. Teachers in the experimental group were asked to give their opinion on the additional report describing student groups and on their use of the proposed recommendations.

Some teachers said that the reports had been very useful for them and had encouraged them to change their teaching practice, for example: 'thanks to the reports we have identified the *backbone* of the class and organized our work with the other children around this *backbone* group'. One interviewee noted, however, that the reports had not been helpful at all and that her observations contradicted the diagnostic results. In one case, the reports were not forwarded by the school coordinator to the teacher. Most of the teachers in the experimental group (four out of five) pointed out that having the description of the groups was better than having solely the information about the children's scores. Thus, in this study, we have tested the initial recommendations for strategies of interaction with different student groups. In the future, we plan to elaborate on and improve these recommendations based on the interview data.

In the present study, no differences in mathematics performance between children in the experimental and control groups were found at the end of the school year. There was also no relationship between the teacher's knowledge of which group the student belonged to and the student's mathematics performance at the end of the school year. Not only did we find no positive effect of teachers' expectations, but also no negative one (Golem effect). This is especially important to note since the additional reports provided to the teachers included information about the at-risk group of students, who had poor cognitive and non-cognitive skills. Interviews with teachers in both control and experimental groups showed that they tried to create a warm and positive classroom climate, motivate children to study regardless of their level of cognitive and non-cognitive skills, and level up the children's cognitive

skills by the middle of the 1st grade. Most teachers noted that they attempted not to reveal their expectations to the children, but to support the willingness of first-graders to do tasks that are difficult for their level, to give equal attention to all children, and provide objective feedback. One teacher even mentioned that 'excellent pupils can get F's too'. During the interviews, it was also found that the majority of teachers in both groups practiced group work during the lessons and, when forming groups, tried to make them heterogeneous in terms of children's cognitive and non-cognitive skills.

The absence of effects could be explained by the fact that our study started in October, i.e. one month after the teachers met their students for the first time. Moreover, the teachers admitted that they got to know most students even before the start of the school year. Many of them had attended preparatory groups at school, some came from the families the teachers already knew because the first-graders' older siblings had already attended the same school, etc. As a result, by the beginning of the school year, teachers might already have certain ideas and expectations about the children in their class. One of the teachers said, however, that he needs at least a year to get to know students well enough and to form some expectations of them.

The analysis of the teachers' retrospective evaluation of the students' cognitive skills at the beginning of the year showed that the teachers in the experimental group had not been guided by the report data when forming their opinions and expectations. However, the statistical results contradict the teachers' answers to the interview questions. The majority of the teachers said that most children had shown the results the teachers had expected from them. At the same time, teachers cared more about the children's behavior during testing rather than about the diagnostic results. Most teachers tested their students themselves. The teachers were pleasantly surprised by some of the children who did better during the test than the teachers had expected. In some cases, the teachers said that the emotional potential of the child had been unleashed during the test. Thus, the teachers had already built certain expectations of the children before the test. The teachers formed their expectations mainly based on student files, family characteristics, students' motivation, and discipline.

The inability to provide methodological support to the teachers in the experimental group — to teach them how to use the report, monitor their work with the report, and provide advice — can be considered a limitation of the research conducted. Research shows that if interventions are not supported and not accepted by teachers, they may not produce an effect [De Boer, Timmermans, van der Werf, 2018].

It should also be noted that during the study, namely in the second half of the school year, schools switched to distance learning. It is not possible to assess statistically whether this transition had an impact on the results of the study.

The conducted study is the first experimental research on the effects of teachers' expectations on student academic achievement in Russian schools.

The study was implemented in the framework of the Basic Research Program at the National Research University Higher School of Economics (HSE University).

The authors thank Prashant Loyalka, Senior Research Fellow at Stanford University and Leading Research Fellow at the International Laboratory for Evaluation of Practices and Innovations in Education at the National Research University Higher School of Economics (HSE University), and James Chu, Research Fellow at Stanford University, for their contribution to the discussion of the experimental research design.

Appendix Balance Test after the Randomisation of Schools

	Baseline assessment. Scores in mathematics (SD)	Baseline assessment. Scores in reading (SD)	Baseline assessment. Scores in behavior (SD)	Baseline assessment. Scores in communication (SD)	Female (yes/no)	Class size	Teaching experience (year)	The teacher completed higher education (yes/no)	The teacher believes that the information about the groups is helpful (yes/no)	The teacher focuses efforts on low-performing students (yes/no)
Experimental group	0.003	0.040	–0.043	0.021	0.014	0.539	0.813	0.007	–0.077	–0.087
	(0.006)	(0.042)	(0.046)	(0.063)	(0.011)	(1.074)	(1.486)	(0.050)	(0.056)	(0.062)
Constant	–1.590***	–1.269***	–0.530	–0.485	0.188	2.974	33.125***	0.662***	0.384	0.725**
	(0.079)	(0.339)	(0.427)	(0.380)	(0.123)	(5.097)	(7.052)	(0.237)	(0.264)	(0.292)
N	5.183	5.183	5.390	5.391	5.392	288	288	288	288	288
R^2	0.238	0.263	0.057	0.068	0.014	0.395	0.193	0.210	0.214	0.171

Note. Robust standard errors, clustered at the school level, are given in parentheses. Strata fixed effects are included.

***p < .01, **p < .05, *p < .10.

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