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Predictors of reading proficiency in Romanian 15-year-old students: findings from PISA 2018

Octavia BORŞ•

Abstract

This study investigates the predictors of reading proficiency among 15-year-old Romanian students using data from the PISA 2018 assessment. For many years, a significant proportion of students have not met the basic proficiency level in reading, as measured by PISA. Previous research indicates that family background is the strongest predictor of academic achievement among Romanian students; however, there is a lack of evidence regarding the contribution of specific teaching practices. Using multiple linear regression analysis, this study shows that when controlling for the social, economic, and cultural status of students, teacher-directed instruction negatively impacts reading proficiency. Furthermore, learning in a positive disciplinary climate, students' enjoyment of reading, and parental support also contribute to reading proficiency. The results underscore the need for more policies and interventions tailored to support students with low social, economic, and cultural status. Additionally, the study highlights the need for increased support for teachers to improve their practice by balancing direct instruction with more constructivist approaches.

Key words: reading literacy, PISA 2018, teacher-directed instruction, economic, social and cultural status, parental support, students' enjoyment of reading

Introduction

Adult literacy has a significant impact on health (DeWalt et al., 2004), occupational assignment (Boothby, 2002), earnings and employment (Lane & Conlon, 2016), and there is evidence that literacy explains partially the impact of schooling itself on earnings (Green & Riddell, 2002). Adult life can contribute to the development or losses of literacy proficiency (Wicht, Rammstedt & Lechner), but school has a significant and lasting effect; skills acquired by age 15 are at least partially maintained into young adulthood (Gustafsson, 2016, Strakova & Vesely, 2019). Furthermore, early literacy skills are important predictors for math skills

• Universitatea din București, București, România, octavia.bors@gmail.com

(Purpura & Napoli, 2015, Peng et al., 2020), science skills (Morgan et al., 2024) and academic achievement of students with high socioeconomic risk (Herbers et al., 2012).

As shown by PISA, the reading skills of Romanian 15-years-old students are the lowest in Europe (OECD, 2023), 4 out of 10 students not reaching the minimal level of competence (Nausica Noveanu et al., 2023). PISA also shows that Romania has one of the highest worldwide students` performance gap (OECD, 2019b), which significantly increased after the COVID 19 pandemic (OECD, 2023). Students whose parents have lower educational levels and occupational statuses are more likely to not acquire basic reading skills (Nausica Noveanu et al., 2023), which influences their future learning and adult life. Therefore, understanding students` reading literacy performance is critical for future educational policy and practice.

In Romania, research has consistently demonstrated that students` learning outcomes are to an important extent predicted by their parent's education (Tufiș, 2008), socioeconomic status (Hatos, 2008), parents` occupational status and resources (Țoc, 2016), and the school of origin being located in a socioeconomically disadvantaged area (Gheba, 2021). Class-based educational inequalities have been attributed to pedagogical practices favouring middle- and high-class students (Borș, 2020). Additionally, there are other structural factors that contribute to persisting educational inequalities in Romania. In 2022, only 81% of 5-years-old Romanian children were enrolled in kindergarten (OECD, 2024a), which limits their early literacy skill development. Hungarian students learning in Romanian have lower academic performance than their peers (Hatos, 2011).

Little is known about the predictive power of students economic, social and cultural status on their literacy skills within the Romanian context when controlling for other school and individual factors. There is also a lack of evidence regarding which other factors—particularly teaching practices—have a strong relationship with students' reading literacy skills. This study aims to help fill these gaps in knowledge using PISA data.

In 2018, reading literacy was a major testing domain in PISA; therefore it includes domain-specific data on various factors that may predict students' performance, including reading-specific teaching practices. The purpose of this study is to identify what other factors—beyond economic, social, and cultural status—with a special interest in pedagogical practices—predict the reading achievement of Romanian 15-year-olds.

Reading skills explained

Previous analyses of PISA data show that the economic, social and cultural status has the largest effect on reading proficiency (Thorpe, 2007, Koyuncu and Firat, 2020). The gap of reading skills between students with low and high socioeconomic status sets in very early on, being powerfully associated with differences in acquiring letter-sound knowledge (Duncan & Seymour, 2010). The effect of socioeconomic status is significantly explained by

differences in phonological awareness and vocabulary knowledge between students (Li et al., 2023). Students with low socioeconomic status have poor reading prerequisites and also learn to read at a slower pace compared to their peers with high SES (Dolean et al., 2019).

Students from low socioeconomic backgrounds are more likely to spend less time reading, have less sleep, have higher rates of absenteeism, and have less parental encouragement, which have a negative impact on their literacy proficiency (Buckingham et al., 2013). Very early parental involvement, at ages three and four is associate with higher reading achievement (Reynolds et al., 2008), but students with low socioeconomic status also benefit later from their parents' involvement in literacy activities at home (Hemmerechts et al., 2016).

Early on, the disparities in reading achievement are strongly explained by socioeconomic inequalities but, as children grow, schools explain better the children's reading progress (Aikens & Barbarin, 2008). Socioeconomic inequalities in reading achievement are more likely in differentiated educational systems, with public or private selective schools (Le Donne, 2014). This partly due to schools' social composition, but is explained also by other school factors. 15-year-old students with low socio-economic status reach high proficient skills level in classrooms and schools with good disciplinary climate (Agasisti et al., 2018). Also, differentiated teaching, teacher support (Thorpe, 2007, Koyuncu and Firat, 2020), teachers` feedback (Koyuncu and Firat, 2020) and teachers' stimulation of reading engagement (Meng et al., 2016, Koyuncu and Firat, 2020) have positive effect on students` skills, when controlling for their social, economic and cultural status.

Finally, recent research has showed that there are also individual characteristics that foster reading achievement, such as passion for reading (Thorpe, 2007, Koyuncu and Firat, 2020), self-concept (Ma et al., 2021), intrinsic motivation to read (Froiland & Oros, 2014), strong effort and perseverance (Linnakyla et al., 2004). Teacher support, in particular, foster reader self-concept and academic enjoyment that have a positive influence on reading achievement (Jensen et al., 2018, Ma et al., 2021).

Data Source and Sample Characteristics: PISA 2018

The analysis is based on data from PISA 2018, a large-scale and standardized assessment of 15-year-olds competencies, run by the Institute of Educational Sciences[1], under the coordination of the Organization for Economic Cooperation and Development (OECD).

PISA aims to investigate the extent to which 15-year-old students have the knowledge and the skills that are necessary to fully participate in today`s social and economic life (OECD, 2019a). The study covers three assessment domains - science literacy, reading literacy and

[1] Reorganized in the Education Research Unit within the National Center for Policy and Evaluation in Education in April 2020.

mathematical literacy-, and major domain, chosen from among the three, on a rotating basis. In 2018 the major assessment domain was **reading literacy**, defined as "*understanding, using, reflecting on and engaging with written texts, in order to achieve one's goals, to develop one's knowledge and potential, and to participate in society*" [2] (OECD, 2010, p. 23).

In PISA, the students` skills are assessed using multiple-choice and open-end questions based on real-life situations. Plus, PISA collects data on students' background (learning experiences, demographic and home characteristics), school systems and teaching practices using questionaries administered to students, school principals and teachers (OECD, 2019a).

In Romania PISA 2018 data were collected from a statistically representative sample of 5,081 Romanian, 15-years-old students, from 170 schools, using a mixed multistage and stratified sampling procedure (OECD, 2009), with a validation rate of 99% (N = 5075 tests) (Novak et al., 2020). The sample includes students that are spread evenly across all regions of Romania, including 11 schools and 233 students (4.6%) that are learning in Hungarian.

In terms of urbanization, the sample is skewed in the favour of urban areas, 4285 sampled students (84%) belonging to urban schools. The underrepresentation of students from rural schools is justified taking in consideration that 96.9% of students come from high schools which in Romania are mainly located in cities. As mentioned, most study participants were enrolled in high schools (96.9%) fairly representing the theoretical (40%), technical (50%) and vocational (10%) track of study. The sample is also balanced in terms of gender, including 2444 girls (48.2%) and 2627 boys (51.8%) (Novak et al., 2020).

In 2018 the PISA results (skills assessment) were reported as 10 plausible values with a mean of 500 and a standard deviation of 100. Each of the 10 plausible values were statistically estimated based on the raw score, and represent the ability level at which a student is most likely to be in reality. The plausible values are generated using the Rasch model, which was designed to generate a symmetric continuum on which both item difficulty and student proficiency are represented and related by a logistic function. The most probably proficiency level is estimated based on this logistic model (OECD, 2019s, p.92). The results presented in this article are based on an analysis using the 10 plausible values, and the standard errors were computed by using 80 replicate weights, as advised by OECD.

Research objectives and data analysis

This study aims to develop an explanatory model for the reading performance of 15-year-old students from Romania. Specifically, it seeks to identify the factors that predict the reading skills of 15-year-old students, beyond their economic, social and cultural status, and with a focus on the influence of specific pedagogical practices. The data analysis included

[2] The domain definition has changed in 2018 for countries that tested computer-assisted reading skills by adding 'assessment' to the other 4 general skills covered. (OECD, 2019a)

students` economic, social and cultural status, individual characteristics, pedagogical practices, and school characteristics.

The students` economic, social and cultural status (ESCS) was estimated based on parents' highest level of education, parents' highest occupational status and home possessions (eg.books in the home) as showed in table 1.

Table 1

The index of economic, social and cultural status

Economic, Social and Cultural Status (*ESCS*)	Highest level of parental education (*PARED)* ● The level of education of the parent with the highest level of education expressed in the number of years spent in school. Highest Occupational Status (*HISEI)* ● The occupational status of the parent with the highest occupational status calculated using the International Index of Socio-Economic and Occupational Status. Family possessions (HOMEPOS), index calculated based on students' answers regarding the availability of the following family goods and services: ● TV, child's own room, mobile phone/smartphone, internet connection, cable/satellite TV; ● Classical literature (e.g. Eminescu), poetry books, works of art, books about art, music or design; ● Study table, a quiet place to study, a computer that can be used for school, educational software, useful books for study, technical reference books (technical dictionaries, scientific-technical journals, treaties), dictionary; ● Number of TVs, cars, bathrooms, mobile phones with internet access, computers, tablets, e-book readers, musical instruments; ● The number of books in the library.

The pedagogical practices included in the analysis were: adaptive instruction (adaptivity), teacher support (teachsup), teacher feedback (perfeed), teachers` stimulation of reading engagement (stimread) and teacher-directed instruction (dirins). The spread of these teaching practices was estimated by using 3 or 4 frequency/ opinion questions, contextualized to lessons of Romanian language and literature, addressed to students, according to table 2. For the purpose of this analysis, I have used the indices calculated by the PISA consortium using the Rasch model (OECD, 2009). The positive values of the indices indicate that the perceived frequency of practices is higher than the average frequency in OECD countries regarding that specific pedagogical practice.

Table 2
Pedagogical practices

Teaching practice	Items
Adaptive instruction (ADAPTIVITY)	• The teacher adapts the lesson to my class's needs and knowledge; • The teacher provides individual help when a student has difficulties understanding a topic or task; • The teacher changes the structure of the lesson on a topic that most students find difficult to understand.
Teacher support (TEACHSUP)	• The teacher shows an interest in every student's learning; • The teacher gives extra help when students need it; • The teacher helps students with their learning; • The teacher continues teaching until the students understand.
Teacher feedback (PERFEED)	• The teacher gives me feedback on my strengths in this subject; • The teacher tells me in which areas I can still improve; • The teacher tells me how I can improve my performance.
Teachers` stimulation of reading engagement (STIMREAD)	• The teacher encourages students to express their opinion about a text; • The teacher helps students relate the stories they read to their lives; • The teacher shows students how the information in texts builds on what they already know; • The teacher poses questions that motivate students to participate actively.
Directed instruction (DIRINS)	• The teacher sets clear goals for our learning; • The teacher asks questions to check whether we have understood what was taught; • At the beginning of a lesson, the teacher presents a short summary of the previous lesson; • The teacher tells us what we have to learn.

Other indices available in PISA 2018 and considered for the analysis are: parents' emotional support (emosups), learning goals (mastgoal), motivation to master tasks (workmast), value of school (attlnact), self-efficacy (resilience), fear of failure (gfofail), enjoyment of reading (joyread), disciplinary climate (disclima), sense of belonging to school (belong), students competition (percomp) and student cooperation (percoop). These indices were obtained by aggregating 3-5 items included in the context questionnaire for students (OECD 2020).

Although previous studies have shown that the shortage of educational materials at school level (Țoc, 2016) and the students' place of residence (Kryst et al., 2015) are important for explaining the performance of Romanian students, these variables were not

included in the analysis due to the large number of missing values. The descriptive analysis reported in Table 10, shows that 96% of the values are missing in the case of the index shortage of educational materials.

Also, PISA 2028 did not investigate the students' place of residence, but the location of the school through a question asked to the students in the background questionnaire. This is problematic because we know that in Romania there are students who live in rural areas, but study in urban areas. The reports published by the Ministry of Education do not provide information on this issue, which does not allow us to assess whether the data obtained in the PISA study are representative of the country's school population. At the same time, this item is problematic in terms of the scale use (1-rural locality (less than 3,000 inhabitants), 2-small town (between 3,000 and 15,000 inhabitants), 3-city (between 15,000 and 100,000 inhabitants), 4-large city (between 100,000 and 1,000,000 inhabitants), a very large 5-city (over 1,000,000 inhabitants) because in the case of Romania only 47% of rural localities have less than 3,000 inhabitants, their sizes varying up to ~ 28,000 (INS, 2016).

In order to develop an explanatory model for students' reading performance, I opted for a multiple linear regression analysis (Rotariu et al., 2006, Popa, 2010, Gignac, 2019). I have used SPSS Statistics 25, improved with the Replicates package created by the Australian Council for Educational Research for the analysis of PISA data. The statistics related to the analyses were calculated following the correction of representativeness errors by weighting the data with the variable W_FSTUWT, recommended in the PISA manual (OECD, 2009). In calculating the standard error, SPSS assumes that the data used were collected by a simple, random sampling (equal chances of selecting the individuals in the sample), which means that in the case of PISA statistics (a mixed multistage sampling and stratification sampling procedure) will report underestimated values of standard errors. Thus, for a better approximation of standard errors and confidence intervals I used the Balanced Repeated Replication method with Fay modification (OECD, 2009). Descriptive and inferential statistics involving students' test scores were calculated as an average of the values obtained for each of the 10 plausible values (OECD, 2009).

Research results

The preliminary analysis shows that some of the independent variables initially considered have a negligible correlation with students' reading scores (Cohen, 1994). Namely, *adaptative instruction*, *teacher support* and *teacher feedback* have a correlation score under 0.1 with students` reading score. Also, individual and learning environment characteristics, such as *motivation to master goals*, *value of school, fear of failure*, respectively *sense of belonging to school* and *students' competition*, correlate negligibly with the reading score. Due to very low correlation, these variables were not considered for the multiple linear

regression analysis. The results of the descriptive and correlation analysis can be found in Table 10 and 11, Annex 1.

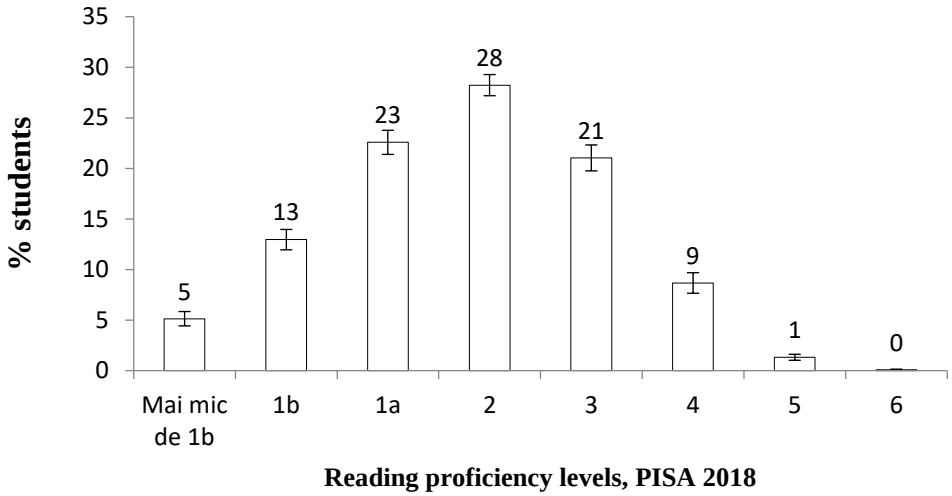
The descriptive analysis and correlation analysis showed that *the economic, social and cultural status* of students strongly correlates with their score in reading. Out of the pedagogical practices investigated in PISA 2018, only *teacher-directed instruction* and *teachers` stimulation of reading engagement* correlate significantly with the students` reading score. Other variables that significantly correlate with the reading score and were included in the analysis are: *parents' emotional support, enjoyment of reading, motivation to master tasks, self-efficacy, disciplinary climate, student cooperation*. Therefore, these variables were considered for the multiple linear regression analysis. The results of the descriptive and correlation analysis can be found in Table 5 and 6.

The descriptive analysis of the data shows that almost half of Romanian students (41%) scored below level 2 in reading, which means that they cannot locate and infer certain information from incomplete texts, where information is presented implicitly (OECD, 2019a). Romanian students obtained an average score of 428 (M=427.7, SE=5.19, SD=98.38, SE=2.21), lower than 487, the OECD average (OECD, 2019b). The Romanian students' scores are normally distributed around the mean, being only slightly flattened (Bolt= -.23) and skewed to the left (Obliquity= -.16).

The average score obtained by Romanian students corresponds to the minimum level of proficiency in reading literacy (2). The distribution of scores on proficiency levels shows that about 7 out of 10 Romanian students have low and minimal reading proficiency (≤ level 2) and 3 out of 10 have medium reading proficiency. Only about 1 Romanian student out of 100 has high reading proficiency (≥ level 5), compared to the OECD average (2019b) where ~9 pupils out of 100 score at this level. In interpreting the graph, one should bear in mind that, according to PISA assessment framework (OECD, 2019b), 2 is the minimum proficiency level at which 15-year-old students should be, 3 and 4 are average levels, and 5 and 6 are high proficiency levels. Thus, it can be seen that although normally distributed, in terms of performance, Romanian students' scores are concentrated at the minimum level (2) or below.

Figure 1

Romanian students' distribution on reading proficiency levels



* Standard errors and confidence intervals can be found in Table 8, Annex 1.

Table 3

Average reading score by economic, social and cultural status (ESCS) of students

ESCS	Average reading score	Standard error
Very low status/ Quartile 1	376	5.12
Low status/ Quartile 2	417	4.68
High status/ Quartile 3	436	4.67
Very high status/ Quartile 4	484	5.63

N=147547

The distribution of the average reading score by the economic, social and cultural status (ESCS) of students shows that the percentage of low achievers is higher for low ESCS and increases with ESCS. On average, in OECD countries only 2.9% of very low ESCS students compared to 17.4% of very high ESCS students are highest achievers, scoring at level 6 of reading proficiency (OECD, 2019b). In Romania, less than 1% of very low ESCS students score at level 5 or 6 compared to ~4% of very high ESCS students. On the other side, 19% of students with very high ESCS score below the minimum proficiency level compared to 61% of those with very low ESCS.

Data shows that there is a positive and moderate (Cohen, 1994) correlation between the Romanian students' reading literacy scores and their economic, social and cultural status ($r=.43$, $SE=0.02$, $p<0.01$). As previous studies (Țoc, 2016), PISA 2018 shows that students

with high economic, social and cultural status systematically achieve higher reading scores than students with lower status.

Table 4

% of students by economic, social and cultural status and proficiency reading level

	< 1b	1b	1a	2	3	4	5	6
Very low status	11%	21%	29%	25%	11%	2%	0	0
Low status	5%	15%	25%	30%	19%	6%	1%	0
High status	3%	11%	22%	30%	23%	9%	1%	0
Very high status	1%	4%	14%	28%	31%	19%	4%	0

N=147547,

Standard errors and confidence intervals can be found in Table 9, Appendix 1.

Also, there are statistically significant correlation, of low intensity, between Romanian students' reading literacy scores and the frequency of different pedagogical practices. According to the analysis, a higher frequency of teacher-directed instruction is slightly correlated with lower reading scores (r=-.14, r2=1.9%, p<0.01). On the other hand, more frequent teachers` stimulation of reading engagement is slightly correlated to higher reading literacy scores (r=.12, r2=1.3%, p<0.01).

Also, as it can be seen in the bivariate correlation matrix (Table 6) parents' emotional support, enjoyment of reading sand disciplinary climate is positively to moderately correlated with Romanian students' reading scores. Last but not least, the score is positively correlated with students` motivation to master tasks, self-efficacy and cooperation, but the value of the correlation coefficient is small.

The results of the preliminary analyses show that for the variables under consideration, the conditions for performing multiple linear regression analysis are met:

- the variables (indices) included in the analysis are continuous;
- the indices have a normal distribution, the skewness and kurtosis indicators have values between -1 and 1 with one exception, parents' emotional support, which has a distribution slightly right-skewed and slightly flatter;
- the percentage of missing values is below 4%, with the exception of students` cooperation (13%) and parents` emotional support (10%);
- none of the variables have values lower by 3 interquartile deviations from the first quartile and higher by 3 interquartile deviations from the third quartile, respectively, according to boxplot plots and SPSS demarcations, a sufficient condition according to Gignac (2019);
- there is no multicollinearity among the introduced independent variables, as can be seen in Appendix 1, the tolerance index has values greater than 0.1, and the VIF index has values less than 10 (see Table 12).

Table 5

Descriptive analysis

	N (Missing Values)	Minimum Maximum	Average (Standard Error)	Standard deviation (Standard Error)	Skeweness (Standard Error)	Kurtosis (Standard Error)
Reading score (PVREAD)	148097	93.48	427.7	98.38	-0.16	-0.23
	(0)	742.51	(5.19)	(2.21)	(0.06)	(0.11)
Economic, social and cultural status (ESCS)	147547	-4.22	-0.47	0.97	-0.03	-0.07
	(550)	2.85	(0.05)	(0.02)	(0.07)	(0.13)
Teachers` stimulation of reading engagement (STIMREAD)	145109	-2.3	0.293	1	-0.05	-0.15
	(2953)	2.09	(0.02)	(0.01)	(0.03)	(0.05)
Teacher-directed instruction (DIRINS)	145490	-2.94	0.321	0.97	-0.21	0.09
	(2608)	1.82	(0.03)	(0.02)	(0.06)	(0.11)
Parents' emotional support (EMOSUPS)	134440	-2.45	0	0.95	-0.36	-1.05
	(13658)	1.03	(0.02)	(0.01)	(0.04)	(0.04)
Motivation to master tasks (WORKMAST)	142380	-2.74	-0.01	0.92	0.18	-0.25
	(5718)	1.82	(0.02)	(0.01)	(0.03)	(0.06)
Self-efficacy (RESILIENCE)	143087	-3.17	0.14	0.93	0.39	0.62
	(5011)	2.37	(0.02)	(0.01)	(0.05)	(0.12)
Enjoyment of reading (JOYREAD)	145197	-2.71	0.1	0.96	0.28	0.61
	(2901)	2.61	(0.03)	(0.01)	(0.04)	(0.09)
Disciplinary climate (DISCLIMA)	144918	-2.71	0.38	1.03	-0.41	0.23
	(3180)	2.03	(0.03)	(0.02)	(0.04)	(0.07)
Student cooperation (PERCOOP)	129227	-2.14	0.1	0.96	-0.31	-0.61
	(18871)	1.68	(0.02)	(0.01)	(0.03)	(0.04)

Table 6

Bivariate correlation matrix

		1	2	3	4	5	6	7	8	9	10
1. Reading score	r	1									
	N	148098									
2. Teachers` stimulation of reading engagement	r	.12	1								
	N	145145	145145								
3. Teacher-directed instruction	r	-.14	.37	1							
	N	145490	144346	144346							
4. Economic, social and cultural status	r	.42	.11	-.08	1						
	N	145026	144859	145204	147547						
5. Parents' emotional support	r	.27	.23	.06	.2	1					
	N	134440	133059	133521	134127	134440					
6. Motivation to master tasks	r	.13	.24	.14	.09	.33	1				
	N	142379	141066	141458	142062	132211	142380				
7. Self-efficacy	r	.15	.22	.14	.17	.37	.47	1			
	N	143087	141691	141970	142766	133301	140989	143087			
8. Enjoyment of reading	r	.27	.15	.05	.15	.19	.2	.09	1		
	N	145197	143957	144329	144911	133406	141467	142103	145197		
9. Disciplinary climate	r	.24	.24	.13	.14	.17	.13	.09	.17	1	
	N	144918	143684	144213	144632	132947	140875	141333	143627	144918	
10. Student cooperation	r	.16	.27	.18	.11	.33	.25	.27	.14	.23	1
	N	129227	127883	128213	128880	127956	127059	128067	128232	127726	129227

In order to obtain a final regression model, it was necessary to repeat the analysis twice using the non-selective or standard method (enter). As a first step, I introduced in the analysis the students' reading score as a dependent variable and the economic, social and cultural status, teacher-directed instruction, teachers` stimulation of reading engagement, parents` emotional support, enjoyment of reading, motivation to master tasks, self-efficacy, students` cooperation and disciplinary climate as independent variables. This first model obtained showed that the effect of students` self-efficacy, motivation to master tasks and cooperation, and teachers` stimulation of reading engagement is not statistically significant (see Table 7).

By removing the independent variables with a statistically insignificant effect, I obtained a second and final regression model. The final regression model, with 5 independent variables, explains 28% of reading score variation. According to this model, the index of students' economic, social and cultural status has the highest effect on the reading score. More precisely, after controlling for other variables, an increase of one standard deviation of ESCS index corresponds to an increase of about 33 standard deviations in the reading score.

Of the pedagogical practices, only teacher-directed instruction was found to have a statistically significant effect on students` reading literacy score. Specifically, an increase of one standard deviation of the index of teacher directed instruction corresponds to a decrease of about 15 standard deviations in the reading score. Also, the final regression model shows that the effect of this pedagogical practice is smaller than the effect of students' economic, social and cultural status. The difference between the effect of students' economic, social and cultural status and the effect of teacher-directed instruction is statistically significant with 95% probability because there is no overlap between the confidence intervals (95%) of the standardized effects (Cummings, 2009 in Gignac, 2019).

As for the other variables, students` enjoyment of reading, parents` emotional support and the disciplinary climate, they have a positive effect, significantly lower than that of economic, social and cultural status. Also, the final model shows that the effect of teacher-directed instruction is smaller than the effect of students` enjoyment of reading and has a similar value to the effect of parents` emotional support and disciplinary climate. However, the effect of these variables is positive and the difference between them is not statistically significant, as there is more than 50% overlap between the confidence intervals, which means that the difference is not statistically significant with 95% probability.

Table 7

Regression model 1 and 2

	Model 1				Model 2			
	Standardized Coefficients	Standard Error	Confidence Interval (95%)		Stand. Coef.	Standard Error	Confidence Interval (95%)	
Constant	446.50	3.34	439.95	453.05	445.49	3.44	438.74	452.24
Economic, social and cultural status	31.22	1.99	27.32	35.13	32.69	2.17	28.43	36.95
Enjoyment of reading	17.08	1.48	14.17	19.98	17.48	1.46	14.62	20.34
Teacher-directed instruction	-15.45	2.10	-19.57	-11.32	-14.90	1.77	-18.36	-11.44
Disciplinary climate	13.41	1.75	9.97	16.84	14.20	1.73	10.81	17.60
Parents` emotional support	13.05	1.96	9.21	16.88	14.98	1.86	11.33	18.63
Students` cooperation	2.77*	1.72	-0.60	6.14				
Teachers` stimulation of reading engagement	2.87*	1.91	-0.88	6.62				
Motivation to master tasks	-1.08*	2.05	-5.09	2.94				
Self-efficacy	1.80*	1.85	-1.82	5.42				
R-squared	0.27	0.02			0.28	0.02		

* The value 0 is within the confidence interval, so the effect size is not statistically significantly greater than 0 (OECD, 2009).

Conclusions and discussion

Through this secondary analysis of PISA 2018 data, I set out to investigate whether specific pedagogical practices (adaptive instruction, teacher support, teacher feedback, teachers` stimulation of reading engagement, and teacher-directed instruction) are explanatory variables for the reading scores of 15-year-old Romanians when controlling for their economic, social and cultural status.

Preliminary analysis and multiple linear regression analysis showed that, out the pedagogical practices measured in PISA 2018, only teacher-directed instruction has a statistically significant negative effect on Romanian students' reading scores. Three out of the five pedagogical practices considered (adaptive instruction, teacher support, teacher feedback) are positively but negligibly ($r<.1$) correlated with students' reading scores and therefore were not included in the multiple regression analysis. Teachers` stimulation of reading engagement is a practice that is positively correlated with the reading scores, albeit at a low level. However, the first regression model, after controlling for other variables, showed that teachers` stimulation of reading engagement has no statistically significant effect on reading scores.

The final regression model obtained shows that the economic, social and cultural status of students is the variable with the largest effect on the Romanian students' reading score. The effect of teacher-directed instruction is smaller and comparable to the effect of enjoyment of reading, disciplinary climate and parental emotional support. More specifically, an increase of one standard deviation in the index of teacher-directed instruction is associated with a decrease of about 15 standard deviations in the reading score.

The strong relationship between the reading scores of 15-year-old Romanians and their economic, social and cultural status confirms previous studies (Tufiș, 2008, Țoc, 2016, Ivan, 2019). This result is also consistent with international studies showing that the explanatory power of pedagogical practices is low (Scheerens, 2016), while the explanatory power of economic, social and cultural status remains high (Sirin, 2005). The negative effect of teacher-directed instruction contradicts indicating that directed instruction positively contributes to school achievement (McMullen and Madelaine, 2014). A possible explanation could be that in Romania, this practice is insufficiently balanced by constructivist pedagogical practices, which recent studies suggest would lead to better school outcomes (Hattie and Timperley, 2007, Robertson et al., 2016).

The study`s results show that ensuring equity in education remains an important challenge for Romania. Illiteracy, understood as the ability to read and write, has declined in recent years, but it was not yet eradicated in Romania (Buza, 2022). From a performance perspective, inequity is reflected in the high share of low performing students, the persistent gap among students from different family backgrounds (Ciolan et al., 2021) or from urban and rural areas (Buza & Tușa, 2024, Țoc et al., 2024). Before the pandemic, in 2019, 23% of

8th grade students and ~20% of the 12 grade students scored lower than the minimum level of competence at the national evaluation and baccalaureate (Ministerul Educației și Cercetării, 2019). PISA 2022 shows that in Romania, low reading scores are more likely to be obtained by students with low ESCS, and the strength of the relationship between reading performance and students` socio-economic status is above the OECD average, placing Romania among the most inequitable countries (OECD, 2023).

Although in many countries education doesn`t overcome social inequalities, their relationship between these inequalities and student academic performance has evolved over time and differs across various social, political, cultural, and economic contexts (Gustafsson, Nilsen și Hansen, 2016, Santibanez și Fagioli, 2016). To improve equity and students' achievements is necessary to enhance collaboration between researchers and policymakers (Iftimescu & et al., 2020), between researchers and teachers (Ion et al., 2017), the induction policies and practices of newly qualified teachers (Stîngu, 2020), and to encourage reflective practices (Miulescu & Tacea, 2023). More specifically, it is important to remember that 15-year-old students with low socio-economic status can achieve high proficiency levels in classrooms and schools with a good disciplinary climate, a high number of extracurricular activities, and low teacher turnover (Agasisti et al., 2018).

In Romania, educational policies are dominated by neo-liberal understandings, initially driven by World Bank (Solonean, 2023) and more recently by OECD (OECD, 2024b). The pandemic stirred up discussions about the inequity of education in Romania, but the state`s immediate response did not include transformative policies for greater equity (Mitescu-Manea et al., 2021). This came later with new policies and programs targeting educational inequalities and teacher training (Comisia Europeană, 2024), the effects of which are to be seen in the coming years.

Annex 1

Table 8

% of Romanian students by proficiency reading levels

Proficiency reading level	Percentage	Standard Error	Lower limit	Upper limit
Smaller than 1b	5.13	0.71	3.71	6.55
1b	12.95	1.01	10.94	14.97
1a	22.57	1.19	20.19	24.96
2	28.23	1.05	26.13	30.32
3	21.03	1.28	18.47	23.59
4	8.67	1.02	6.64	10.70
5	1.32	0.30	0.73	1.91
6	0.09	0.05	-0.01	0.20

N=148098

Table 9

% of students by proficiency reading level and economic, social and cultural status (ESCS)

		Smaller than 1b		1b		1a		2.00		3.00		4.00		5.00		6.00	
Very low ESCS	Percentage	11.24		21.45		29.11		25.10		11.33		1.70		0.07			
	Standard Error	1.87		1.73		1.77		1.75		1.39		0.49		0.11			
	Confidence Interval (95%)	7.49	14.98	17.99	24.92	25.57	32.65	21.60	28.59	8.54	14.12	0.73	2.67	-0.14	0.29		
Low ESCS	Percentage	4.52		15.30		25.01		30.04		18.57		5.84		0.72		0.01	
	Standard Error	0.97		1.64		1.64		1.79		1.80		0.88		0.42		0.04	
	Confidence Interval (95%)	2.57	6.47	12.01	18.59	21.73	28.28	26.47	33.61	14.96	22.18	4.08	7.60	-0.13	1.56	-0.07	0.09
High ESCS	Percentage	3.46		10.57		22.50		30.49		23.49		8.62		0.82		0.04	
	Standard Error	0.73		1.28		1.45		1.67		1.69		1.40		0.32		0.08	
	Confidence Interval (95%)	2.00	4.92	8.02	13.12	19.60	25.40	27.15	33.84	20.11	26.86	5.83	11.42	0.18	1.47	-0.13	0.21
Very high ESCS	Percentage	0.77		4.36		13.94		27.60		30.82		18.53		3.66		0.32	
	Standard Error	0.34		0.81		1.62		2.02		1.90		1.91		0.74		0.20	
	Confidence Interval (95%)	0.09	1.46	2.73	5.98	10.70	17.18	23.55	31.64	27.02	34.63	14.72	22.34	2.17	5.15	-0.08	0.73

N=147547

Table 10

Descriptive analysis

	N (Valori lipsă)	Minim Maxim	Media (Eroarea Standard)	Abaterea Standard (Eroarea Standard)	Oblicitate (Eroarea Standard)	Boltire (Eroarea Standard)
Adaptive instruction (ADAPTIVITY)	144484	-2.26	0.041	0.98	0.03	0.13
	3614	2.01	0.02	0.01	0.03	0.05
Teacher support (TECHSUP)	145875	-2.71	0.22	0.97	-0.67	-0.02
	2735	1.31	0.02	0.02	0.03	0.08
Teacher feedback (PERFEED)	145361	-1.63	0	0.92	0.19	-0.47
	4836	2.02	0.02	0.01	0.03	0.03
Students' competition (PERCOMP)	133299	-1.9892	0.13	0.92	-0.07	-0.2
	14799	2.0378	0.02	0.01	0.03	0.04
Motivation to master tasks (MASTGOAL)	142815	-2.53	0.1	1.01	-0.12	-0.15
	5283	1.85	0.02	0.01	0.03	0.05
Value of school (ATTLNACT)	142538	-2.54	0	0.92	-0.35	-0.78
	5560	1.08	0.02	0.01	0.03	0.06
Fear of failure (GFOFAIL)	142946	-1.89	-0.27	0.89	0.19	-0.02
	5151	1.89	0.01	0.01	0.02	0.05
Sense of belonging to school (BELONG)	143008	-3.2367	-0.03	0.94	1.03	1.86
	5090	2.7849	0.02	0.02	0.05	0.13
Shortage of school materials (EDUSHORT)	5793	-1.42	0.36	0.9	-0.022	0.093
School locality (SC001Q01TA)	142304	2.96	0.08	0.05	0.18852	0.29192
	5699	0				
	142399	1				

Table 11

Bivariate correlation matrix

		Reading score	Adaptive instruction	Teacher support	Teacher feedback	Motivation to master tasks	Value of school	Fear of failure	Sense of belonging to school	Students competition
1.Reading score	r	1								
	N	148098								
2.Adaptive instruction	r	.06	1							
	N	144484	144484							
3.Teacher support	r	-.05	.41	1						
	N	145363	143975	145363						
4.Teacher feedback	r	-.03	.48	.39	1					
	N	143262	141914	142553	143262					
5. Motivation to master tasks	r	.08	.16	.18	.21	1				
	N	142815	140947	141677	139854	142815				
6. Value of school	r	.04	.1	.15	.13	.41	1			
	N	142538	140573	141359	139292	140271	142538			
7.Fear of failure	r	.02	-.01	-.07	-.01	.07	.02	1		
	N	142946	141184	141865	139872	141504	140438	142946		
8. Sense of belonging to school	r	.08	.16	.14	.16	.2	.21	-.17	1	
	N	143008	140961	141746	139789	141788	140059	141317	143008	
9. Students competition	r	.07	.1	.08	.16	.19	.11	.08	.13	1
	N	127567	131642	132201	130613	131964	130754	131825	132208	127567

Table 12

Tolerance index and VIF

Independent variables	Tolerance	VIF
Economic, social şi cultural status (ESCS)	0.909	1.100
Teachers` stimulation of reading engagement (STIMREAD)	0.757	1.321
Teacher-directed instruction (DIRINS)	0.824	1.214
Enjoyment of reading (JOYREAD)	0.910	1.098
Motivation to master tasks (WORKMAST)	0.708	1.412
Self-efficacy (RESILIENCE)	0.692	1.446
Parents' emotional support (EMOSUPS)	0.763	1.311
Disciplinary climate (DISCLIMA)	0.889	1.125
Students cooperation (PERCOOP)	0.816	1.226

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