THE EFFECTS OF EARLY LITERACY ACTIVITIES UPON READING ACHIEVEMENT IN GRADE FOUR IN EASTERN EUROPEAN COUNTRIES

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Abstract

In 2001, The International Association for the Evaluation of Educational Achievement (IEA) studied children's reading literacy and the factors associated with its acquisition. The IEA's Progress in International Reading Literacy Study (PIRLS) assessed the reading achievement of 9- and 10-years-olds and collected information about the experiences children had at home and school when learning to read. PIRLS was based on IEA's 1991 Reading Literacy Study and complements the IEA's Trends in International Mathematics and Science Study (TIMSS), which regularly assesses achievement at fourth and eighth grades. PIRLS also complemented the OECD's Programme for International Student Achievement (PISA), which assesses the reading literacy of 15-year-olds.

The study presented in this paper is a secondary analysis of data collected by PIRLS, conducted by The IEA in 2001 with 35 participating countries. The PIRLS database contains internationally comparable data from test items in reading, together with background data collected from students, their teachers, the principals of their schools, and their parents.

Since I am Romanian, I have a special goal of trying to improve reading education in my country. Because of their similarities in terms of geographical, political, cultural, and socio-economic factors, it is informative to compare Romania to Bulgaria and Moldova. All three are young democracies formed after the fall of the communist regimes, and their current development is based on the western European model, including the values of a civic society and a market economy. Their education systems are state-administered and centralized. The vast majority of students in these countries speak the language of the PIRLS test at home although, due to the presence of minorities, Moldova administered the instrument in both Romanian and Russian, while Romania tested in Romanian and Hungarian. Bulgaria administered the test in Bulgarian only.

LITERATURE REVIEW

A great deal of research has been devoted to the importance of home environments for children's reading literacy. Particular home characteristics can encourage young children to explore and experiment with printed and oral language, which in turn can establish a foundation for learning.

In a recent article published in United States, Peck (2004) describes the University of Oregon's assessment tools called Dynamic Indicators of Basic Early Literacy Skills (DIBELS) created to monitor the development of pre-reading and early reading skills in kindergarten through Grade 3. The DIBELS assessments measures essential early literacy domains discussed in both the National Reading Panel (2000) and National Research Council (1998) reports and written into the U.S. federal No Child Left Behind legislation. Specifically, the early literacy domains are student awareness of sounds, letters, letter-sound connections, and reading speed and accuracy, all indicators of early reading progress and predictors of later reading proficiency.

The above-mentioned IEA's 1991 Reading Literacy Study focused on "students in the grade levels where most 9- and 14-years-olds were to be found in 32 systems of education" (Elley, 1992, p. XI). For most countries, the study found that reading literacy scores were closely related to "national indices of economic development, health, and adult literacy" (Elley, 1992, p. XI). Another key factor

found by IEA's Reading Literacy Study was students' access to books, either in the home, in nearby community libraries and bookstores" or in the school (Elley, 1992, p. XIII).

Despite the fact that, as discussed above, the indices of economic development, health, and adult literacy of a country are generally positively correlated with students' performance, PIRLS 2001 data suggest only a rough correspondence across Bulgaria, Moldova, and Romania. Each country's gross national product (GNP) per capita, as indicated by PIRLS 2001 Encyclopedia (Mullis et. al, 2002) at the time of the test, was rather small compared to industrialized countries: Romania (US$ 1,670), Bulgaria (US$ 1,300), and Moldova (US$ 410). Their public expenditure on education, as reported by The World Bank in 2000, cited by Mullis et al (2002), ranged from 3.4% in Bulgaria, to 4.0% in Moldova, and 4.4% in Romania.

However, as shown in Figure 1, each of these three countries performs differently in terms of reading achievement: Bulgaria is a top-performer with an average scale score of 550, Romania's average scale score of 512 is close to the international average of 500, and Moldova is below the international average, with an average scale score of 492.

Figure 1: Average achievement scale scores for Bulgaria, Moldova, and Romania.
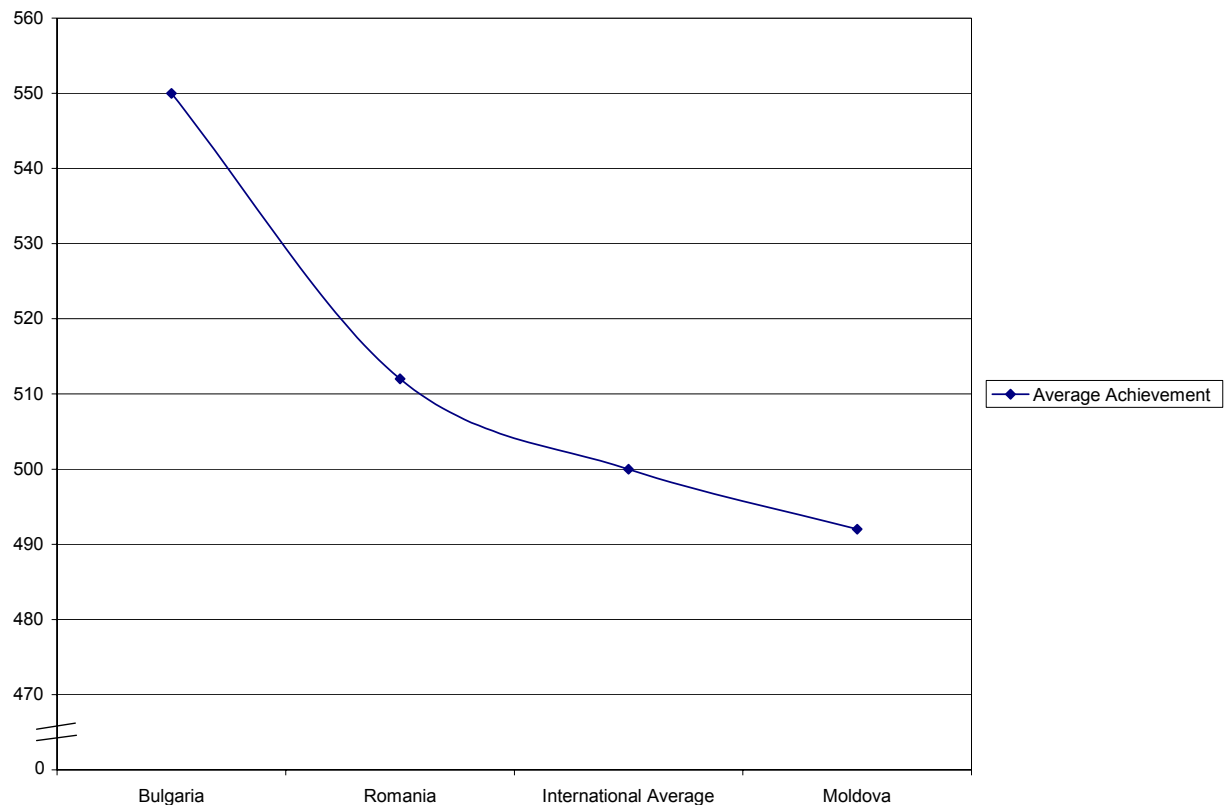
Note: International average is included.

Classification of the three countries, based on results from two of the indices reported in the PIRLS 2001 International Report, indicated a trend similar to the classification based on their achievement. The percentages of students coming from homes with a "High" Index of Early Home Literacy Activities (EHLA) were 62% for Bulgaria, 55% for Romania, and 42% for Moldova. Similarly, the percentages of students coming from homes with a "High" Index of Home Educational Resources (HER) were 11% for Bulgaria, 5% for Romania, and 4% for Moldova. The percentage of fourth-grade students that could do "Very Well" Early Literacy Activities Beginning School, as reported by their parents (the "PELABS" index, as I call it), showed the same trend as the previous indices: Bulgaria 29%, followed by Romania with 18%, and Moldova with 12%. A comparison of the three indices among the three countries is presented in Figure 2.

Figure 2: Percentage of students with "High" EHLA and "High" HER, and that could do "Very Well" Early Literacy Activities Beginning School (PELABS) according to their parents.
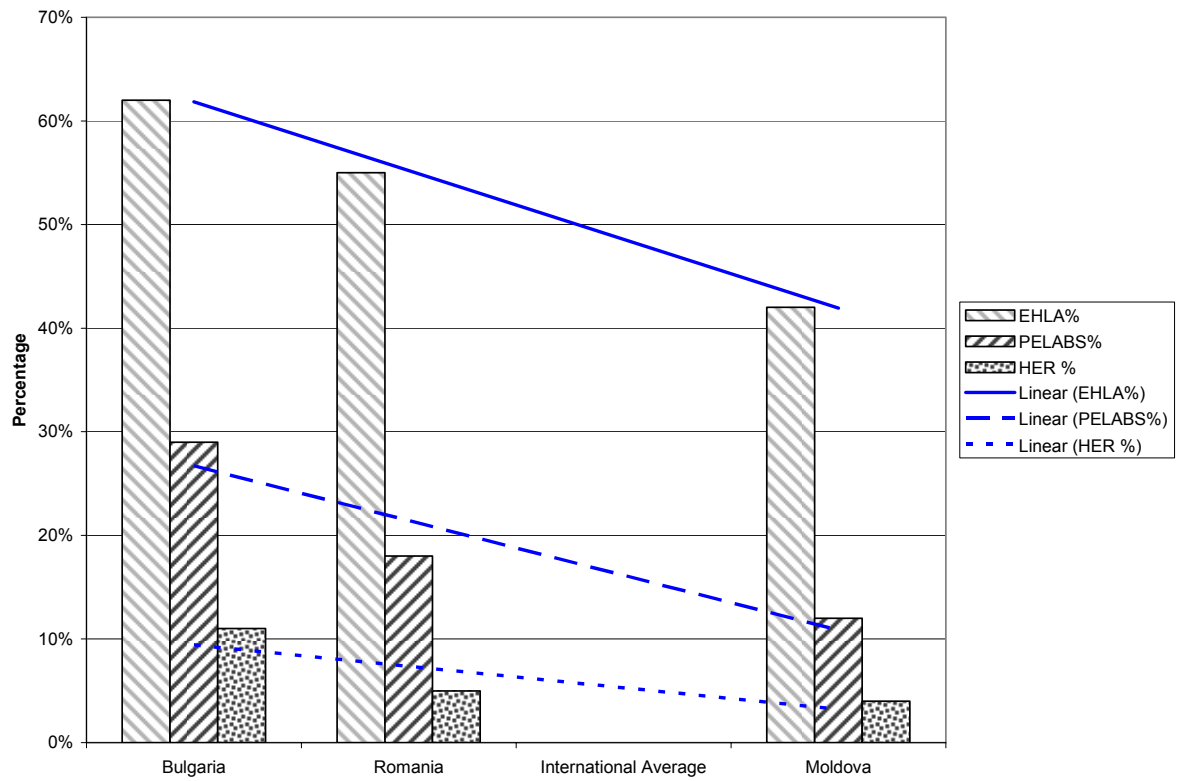
Notice the similarity between the trend lines of the three indices and the trend in reading achievement scores for these three countries.

PIRLS 2001 Encyclopedia (Mullis, 2002) provides information with respect to children's reading readiness in a formal setting. The education systems of the three countries include pre-primary education, although it is neither compulsory nor affordable for all children, especially Moldavian ones. The Encyclopedia specifies that in Bulgaria: "Pre-school education is not compulsory and is for children aged between three and seven." (p. 17), in Moldova: "Pre-primary education […] enroll 33 percent of children 1 to 6 years old… At present, in the conditions of economic crisis, only 52 percent of 5 to 6 year-olds attend preparatory groups for school", while in Romania: "Pre-primary education is available to 3- to 6-year-olds and is not compulsory."

RESEARCH QUESTIONS AND HYPOTHESIS

The specific research questions that will be addressed in this paper are as follows:

1. *How and to what extent des Romanian students' preparedness to learn to read at the beginning of school influence their reading achievement in grade four?*

2. *Having taken into account achievement differences in the three countries that are not attributable to reading readiness beginning school, what strategies are best preparing incoming students to learn to read?*

The literature indicates that an emphasis on early literacy activities, either at home or in preschool, is a powerful explanatory factor of reading achievement. In addition, in previous studies it has been

shown that students' access to educational resources, which is a reflection of the socio-economic status of both the home and the country, is closely related to their levels of reading achievement.

The hypothesis being tested here is that the better the students are prepared to learn to read at the beginning of school the higher their reading achievement in grade four. Therefore, within Romania's national context, as well as compared to Bulgaria and Moldova, the purpose of the current study is to find out if results from The IEA's PIRLS 2001 would confirm this hypothesis.

METHOD

The target population assessed by PIRLS was defined as "the upper of the two adjacent grades with the most 9-year-olds" (Campbell 2001) which, in most of the participating countries, was the fourth grade. PIRLS has chosen this population of students because, by the fourth grade, students have learned how to read and they were making the transition to reading to learn.

Table 1 below summarizes the number of school and students that participated in the PIRLS 2001 from each of the three countries. For the analyses undertaken in this study, it was important to ensure that the three countries were comparable across grades and ages tested. In Table 1 it is shown that the grade tested in all three countries was the fourth year of formal schooling, which is the same as the international average. In terms of age tested, students from these three countries were slightly older than in most of the countries, with the Romanian students being the oldest (11.1 years old).

Table 1: Sample sizes and national grade definitions for Bulgaria, Moldova and Romania

Country	Number of Schools Sampled	Number of Students Sampled	Country's Name for Grade Tested	Years of Formal Schooling	Mean Age of Students Tested
Bulgaria	170	3460	4	4	10.9
Moldova	150	3533	4	4	10.8
Romania	144	3625	4	4	11.1

SOURCE: IEA Progress in International Reading Literacy Study (PIRLS) 2001.

In order to document the home and school contexts where the development of reading literacy takes place, as well as the larger contexts in which children live and learn, PIRLS administered background questionnaires to the students tested, their parents or caregivers, their teachers, and their school principals. The information provided by parents, teachers, and school principals was tied directly to the students tested. Therefore, the student was always the unit of analysis and the data reported in the PIRLS 2001 International Report (Mullis et al., 2003) were percentages of students whose parents, teachers, or school principals reported on various activities or characteristics.

Based on the observed similarity among variables hypothesized to contribute to students' preparedness to read and their hypothesized effect on reading achievement scores, a confirmatory regression model was done for the analysis of reading achievement scores in Bulgaria, Moldova, and Romania and to analyze the two research questions. The following variables collected from the PIRLS 2001 background questionnaires for students and their parents have been chosen as predictor variables:

- Index of Early Home Literacy Activities (EHLA): "Index based on parents' responses to the frequency of the following activities they engaged in with their child prior to entry into primary school: read books, tell stories, sing songs, play with alphabet toys (e.g., blocks with letters of the alphabet), play word games, or read aloud signs and labels. An average is computed across the 6

items based on a 3-point scale: Never or almost never = 1, Sometimes = 2, and Often = 3. High level indicates an average of greater than 2.33 through 3. Medium level indicates an average of 1.67 through 2.33. Low level indicates an average of 1 to less than 1.67" (Gonzalez, 2003, p. 3-13)

Table 2: Index of Early Home Literacy Activities (EHLA) for Bulgaria, Moldova, and Romania

Countries	High EHLA				Medium EHLA				Low EHLA			
	Percent of Students		Average Achievement		Percent of Students		Average Achievement		Percent of Students		Average Achievement	
Bulgaria	62	(1.7)	569	(3.2)	25	(1.0)	541	(5.0)	12	(1.6)	503	(10.1)
Romania	55	(1.4)	527	(4.6)	31	(1.1)	505	(5.5)	15	(1.2)	485	(10.8)
Moldova, Rep. of	42	(1.3)	511	(4.9)	39	(1.1)	486	(4.3)	19	(1.2)	469	(5.6)
International Avg.	52	(0.2)	520	(0.7)	35	(0.2)	499	(0.8)	13	(0.2)	481	(1.3)

Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

SOURCE: IEA Progress in International Reading Literacy Study (PIRLS) 2001.

- Index of Home Educational Resources (HER) Index based on students' responses to two questions about home educational resources: number of books in the home, and educational aids in the home (computer, study desk/table for own use, books of their own, access to a daily newspaper); and parents' responses to two questions: number of children's books in the home, and parents' education. High level indicates more than 100 books in the home, more than 25 children's books, 3 or 4 educational aids, and highest level of education for either parent is finished university. Low level indicates 25 or fewer books in the home, 25 or fewer children's books, 2 or fewer educational aids, and highest level of education for either parent is some secondary or less. Medium level includes all other combinations of responses" (Gonzalez, 2003, p. 3-13)

Table 3: Index of Home Educational Resources (HER) for Bulgaria, Moldova, and Romania

Countries	High HER				Medium HER				Low HER			
	Percent of Students		Average Achievement		Percent of Students		Average Achievement		Percent of Students		Average Achievement	
Bulgaria	11	(0.9)	605	(4.2)	75	(1.7)	558	(3.1)	14	(1.8)	493	(10.5)
Romania	5	(0.9)	575	(6.9)	78	(1.1)	520	(4.3)	17	(1.2)	469	(8.3)
Moldova, Rep. of	4	(0.7)	568	(6.8)	89	(1.1)	492	(3.9)	7	(0.9)	459	(8.0)
International Avg.	13	(0.2)	548	(1.3)	74	(0.2)	504	(0.6)	13	(0.2)	443	(1.5)

Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

SOURCE: IEA Progress in International Reading Literacy Study (PIRLS) 2001.

- Parents' estimation of their child early literacy skills beginning primary school (PELABS), an index computed "based on parents' responses to questions about how well their child could do the following when he/she began primary school: recognize most of the letters of the alphabet; write

letters of the alphabet; read some words; write some words; and read sentences …. Average is computed across the 5 items based on a 4-point scale: Not at all = 1, Not very well = 2, Moderately well = 3, and Very well = 4. Very well indicates an average response score of greater than 3.25 through 4. Moderately well indicates an average of greater than 2.5 through 3.25. Not very well indicates an average of 1.75 through 2.5. Not at all indicates an average of 1 to less than 1.75". (Mullis, 2003, p. 135). The values for the items included in the computation of the PELABS index for Bulgarian, Moldavian and Romanian students who can do "Very well" early literacy activities, according to their parents, are detailed in the following Table 4:

Table 4: Students whose parents reported they could do specific early literacy activities beginning school for Bulgaria, Moldova, and Romania

Countries	Percentage of Students Who Could Do Activity Very Well				
	Recognize Most of the Alphabet	Write Letters of the Alphabet	Read Some Words	Write Some Words	Read Sentences
Bulgaria	49 (1.4)	38 (1.2)	25 (1.0)	21 (0.9)	14 (0.8)
Moldova, Rep. of	21 (1.1)	16 (0.8)	11 (0.9)	12 (0.9)	7 (0.6)
Romania	20 (1.1)	26 (1.3)	13 (0.9)	16 (1.0)	8 (0.7)
International Avg.	32 (0.2)	27 (0.2)	18 (0.2)	17 (0.2)	12 (0.1)

Background data provided by parents.
Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

SOURCE: IEA Progress in International Reading Literacy Study (PIRLS) 2001.

- Parents' reports on the number of years their child attended preprimary education (preschool, kindergarten, and other similar programs) are summarized in Table5 for the three countries.

Table 5: Number of years in preschool for Bulgaria, Moldova and Romania

Countries	Did Not Attend		Up to and Including 1 Year		Greater than 1 Year up to and Including 2 Years		More than 2 Years	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Bulgaria	13 (1.3)	538 (9.0)	14 (1.1)	541 (7.1)	16 (0.8)	557 (4.8)	57 (1.7)	559 (3.4)
Moldova, Rep. of	15 (1.5)	489 (8.0)	13 (1.0)	481 (7.9)	15 (0.8)	492 (6.7)	57 (2.0)	497 (4.0)
Romania	8 (0.9)	485 (10.6)	10 (0.8)	498 (7.1)	23 (1.4)	513 (6.9)	59 (1.8)	524 (4.8)
International Avg.	16 (0.2)	491 (1.8)	21 (0.2)	504 (1.1)	23 (0.2)	512 (1.1)	40 (0.2)	523 (1.2)

Background data provided by parents.
Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

SOURCE: IEA Progress in International Reading Literacy Study (PIRLS) 2001.

The first three variables indicate the aspects of students' reading readiness in the informal, home-based environment, while the number of years in preschool represents the variable that shows

children's opportunity to become prepared in a formal, organized setting. All four variables will be included into a regression model that accounts for early literacy activities, at each country level and across countries.

For comparative purposes, the EHLA and HER indices were recoded so that the lowest level was indicated by the lowest value on the scale. The number of years in pre-primary education was also recoded, so that a value of "0" was given to all "logically not applicable" cases, which originally were labeled as missing values. This technique reduced the number of missing data from 1673 to 430 cases.

RESULTS AND DISCUSSION

Before proceeding with the analysis of the regression models, it is useful to look at the descriptive statistics for our chosen predictor variables, both at each country level as well as for all three countries. Table 6 summarizes the mean for each predictor and the percentages of students at the average level for each country and for all three combined. This table shows that Bulgarian parents had a more positive view of their children's early literacy skills than the Moldavian and Romanian parents; the same holds true for the EHLA index. It is also notable from Table 6 that more parents of Romanian students reported that their children had attended more than two years of pre-primary education.

Table 6: Descriptive statistics for the four predictors for each country and for the three countries together

Country	Mean PELABS	Percent of Students
All three	2.48	29.5 (not very well) 28.5 (moderately well)
Bulgaria	2.74	30.6 (moderately well) 27.2 (very well)
Moldova	2.29	35.6 (not very well) 27.4 (moderately well)
Romania	2.43	30.8 (not very well) 27.7 (moderately well)
	Mean EHLA	Percent of Students
All three	2.37	50.6 (high)
Bulgaria	2.50	58.5 (high)
Moldova	2.22	37.7 (medium) 40.7 (high)
Romania	2.40	52.7 (high)
	Mean HER	Percent of Students
All three	1.38	60.9 (low-medium)
Bulgaria	1.41	58.4 (low-medium)
Moldova	1.41	58.1 (low-medium)
Romania	1.33	66.1 (low-medium)
	Mean PREYRS	Percent of Students
All three	4.09	58 (more than 2 years)
Bulgaria	4.04	57 (more than 2 years)
Moldova	3.97	57 (more than 2 years)
Romania	4.24	59.0 (more than 2 years)

Research question number 1:

The aim of the first analysis was to look at the factors that contribute to Romania's students' readiness to read and their effects on reading achievement scores. A multiple regression model was built for Romania and, for comparative purposes, one for Bulgaria and one for Moldova. The order of entry into the regression model for the predictors was based on the theoretical considerations found in the literature and on the logical grouping of variables that account for students' reading readiness first at home, i.e. the PELABS, EHLA, and HER variables, and secondly at pre-school, i.e. the Pre-school years (this variable was labeled PREYRS, for notation simplification). The results of each individual regression analysis are summarized in the following Table 7:

Table 7: Model summary at each country level with Romanian results highlighted

Predictor	Standardized Partial Regression Coefficients
PELABS	7.207*
EHLA	1.665
HER	5.678*
PREYRS	3.608*

*Results are statistically significant at 0.05 level (significance p is given in parenthesis).

For the Romanian students, PELABS has a strong relationship with reading achievement, followed by HER. The better the parents estimated students' early literacy skills, the higher was students' reading score. The more Romanian students had access to educational resources the higher was their reading achievement in grade four.

It is interesting to notice that, although Romanian parents possessed such a good estimate of their child early literacy skills beginning primary school, the Index of Early Home Literacy Activities (EHLA) had only a marginally significant effect on reading achievement.

After partialing out the effect of the variables that account for Romanian students' reading preparedness under parental supervision and in the nurturing home environment, the number of years spent in preschool (PREYRS) had a small but significant effect upon reading achievement. The more time students spent in preschool, the higher was their reading achievement.

The regression solution for Bulgaria indicated that Bulgarian parents had a stronger relationship between the estimate of their children's reading readiness and students' reading performance than their Romanian and Moldavian counterparts. Similar to Romania, in Bulgaria PELABS was a stronger predictor of reading achievement than HER. A difference between Bulgaria and Romania was that in Bulgaria the pre-school years (PREYRS) had a statistically insignificant negative effect upon reading achievement scores.

Moldova was also similar to Romania in the sense that PELABS had the strongest effect on reading achievement among the predictors considered in this regression analysis, followed by EHLA and HER. For Moldavian students, the number of years they spent in preschool was not statistically significant in predicting reading achievement in grade four. This result may be explained by the observation made in PIRLS 2001 Encyclopedia, quoted in the beginning of this paper, that pre-primary education is not affordable to all children, due the economic crisis.

Research question number 2:

For answering research question 2, we need to take into account country differences in achievement. In general, a regression analysis may be used to determine whether group differences exist. However, it is necessary to assign codes to group membership to indicate group differences. In our case, group membership refers to students belonging to one of the three countries discussed here. Dummy coding was used to determine whether mean reading achievement for Bulgaria or Moldova differed significantly from the target mean achievement for Romania. With dummy coding we use "1" and "0" to represent group membership. Dummy vector D_1 indicated membership in the group formed by Bulgarian students. Therefore, with respect to D_1, students that were from Bulgaria were assigned a value of "1" and students that were not from Bulgaria were assigned a value of "0". Similarly, dummy vector D_2 indicated membership in the group formed by Moldavian students. With respect to D_2, Moldavian students were assigned a value of "1" and non-Moldavian students were assigned a value of "0". The group formed by Romanian students was the "target" group and got zeroes on both vectors. The use of dummy codes is summarized in Table 8.

Table 8: Dummy Coding

GROUP	DUMMY 1 (D1)	DUMMY 2 (D2)
Romanian	**0**	**0**
Bulgarian	**1**	**0**
Moldavian	**0**	**1**

The results of the regression analysis for all three countries together are presented in Table 9 below. The order of entry of the predictors was the same as for the regression at each country level, except that the dummy vectors were entered first. Therefore, the differences in reading achievement that are not attributable to students' readiness to learn to read are accounted for in the first place, by using the dummy vectors.

Table 9: Model summary for all three countries

Predictor	Partial regression coefficients	Standardized partial regression coefficients	Significance	R-squared
DUMMY 1 (Bulgaria vs. Romania)	**31.431**	**6.159**	**0.0005**	
DUMMY 2 (Moldova vs. Romania)	**-19.523**	**-3.562**	**0.0005**	**0.194**
PELABS	**17.695**	**14.341**	**0.0005**	
EHLA	**11.402**	**6.169**	**0.0005**	
HER	**22.82**	**8.424**	**0.0005**	
PREYRS	**0.989**	**1.187**	**0.2350**	

The overall model, with all three countries included in the analysis, accounted for almost 20% of the variance in reading achievement scores. In other words, Romanian, Bulgarian, and Moldavian students' preparedness to learn to read at the beginning of school, either in the nurturing home environment, or in the formal preschool setting, provides an explanation for one fifth of the variation in their ability to read in grade four.

Similar to Romania's case alone, the predictor with the strongest effect on reading achievement of all students from these three countries was "parents' estimation of their child early literacy skills beginning primary school" (PELABS), followed by "Index of Home Educational Resources" (HER). However, as opposed to Romania's case, in the regional context, the effect of the number of years spent in preprimary education (PREYRS) was not significant. This may be an area of concern for policy makers, especially in Bulgaria and Moldova.

SUMMARY

The final goal of this paper was to identify at least a few of the factors that make a good Romania and/or Bulgarian or Moldavian fourth grade reader.

In summary, the higher was the reading readiness of Romanian students at the beginning of school the higher was their reading performance in grade four. Students' preparedness to learn to read in the nurturing home environment, as explained by parents' estimation of their child early literacy skills or the presence of educational resources in the home, was found to have a significant positive relationship with reading achievement. In Romania, in particular, the effect of the number of years spent in preprimary education upon reading performance in grade four was significant.

This study is intended to be one step in looking at Romanian data both in the regional and international context and to focus on those variables that can be manipulated as a policy tool in order to improve the reading education in my country.

After taken into account achievement differences in the three countries that are not attributable to early literacy skills, Bulgarian students still had an advantage of 31.431 points over Romanian students, while Moldavian students still had 19.523 points disadvantage compared to their Romanian colleagues.

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