Scaffolding the Learning in Rural and Urban Schools: Similarities and Differences

Smiljana Jošić, Barbara Japelj Pavešić, Nikoleta Gutvajn, and Mojca Rožman

Abstract Education systems can be conceptualized as the scaffolding that supports the construction and development of student competences. Among other things, the size, location, and learning resources of schools can affect how efficient that system is at delivering the required support. Data from international large-scale assessments have indicated that the resources of rural schools may differ from those of urban schools; students in schools in urban and more economically developed environments often demonstrate higher achievement. Data from IEA's Trends in International Mathematics and Science Study (TIMSS) 2019 from across the Dinaric region provides information on variations in the size of schools and allocation, student achievement, and the different kinds of scaffolding/support for learning in urban and rural schools. Secondary analyses of the TIMSS 2019 data for the Dinaric region, taking into account home and school factors, show that the types of support available for student learning differed between urban and rural schools. The findings suggest that policymakers should focus on improving the learning resources available to rural schools across the region, particularly in response to their lack of technological resources for developing students' digital competencies. Concomitant investment is required for the development of teachers' competencies for the effective use of such educational resources. Educators need to compensate for lack of family support for some students; in such situations, schools need to enhance the scaffolding for learning available to children.

Keywords Achievement gap · Grade four · Location of school · Scaffolding · Trends in International Mathematics and Science Study (TIMSS)

S. Jošić (✉) · N. Gutvajn
Institute for Educational Research, Belgrade, Serbia

B. Japelj Pavešić
Educational Research Institute, Ljubljana, Slovenia
e-mail: barbara.japelj@pei.si

M. Rožman
International Association for the Evaluation of Educational Achievement (IEA), Hamburg, Germany
e-mail: Mojca.rozman@iea-hamburg.de

B. Japelj Pavešić et al. (eds.), *Dinaric Perspectives on TIMSS 2019*, IEA Research for Education 13, https://doi.org/10.1007/978-3-030-85802-5_10

1 Introduction

In order to develop and master different competences through learning, students usually benefit from good support for learning: quality teaching, appropriate material resources for learning, and parents and teachers that nurture their academic aspirations. But does the learning support that students receive differ substantially by school environment? We used data collected by IEA's Trends in International Mathematics and Science Study (TIMSS) 2019 to identify whether there were differences in learning environments across the Dinaric region, specifically between urban and rural schools. Seven participants from the Dinaric region took part in TIMSS 2019, namely Albania, Bosnia and Herzegovina, Croatia, Kosovo,[1] Montenegro, North Macedonia, and Serbia. TIMSS provides an opportunity to explore the different types of support (scaffolding) for student learning, enabling us to identify which types of support were provided in the schools in rural areas in comparison with schools situated in more urban locations. We hypothesized that differences among learning of students from rural and urban areas could also be related to students' home support; we thus relate school support to differences in student achievement in science and mathematics between rural and urban schools, taking into account the support that students received, both at the home and school levels.

1.1 Scaffolding the Learning Process

Education systems can be conceptualized as the "scaffolding" that supports the construction and development of student competences (Bruner, 1983; Van de Pol et al., 2010; Wood et al., 1976). Here, we use the term scaffolding to encompass all the different ways of supporting the child in activities that they cannot perform independently (Wood et al., 1976) and where learning process is guided by others (Stone, 1998). Just as scaffolding provides support to workers in the construction of tall buildings and is no longer required when the building is successfully constructed, when a student masters a skill additional support is no longer needed and can be safely removed. In this sense, the term scaffolding reflects the temporary nature of the educational support provided as one of its important characteristics.

The concept of scaffolding offers a new perspective in the study of classroom learning and suggests that learning processes can be reframed to be more attuned to the students' needs. This metaphor of scaffolding can be used to identify different kinds of support, such as: motivating the students to work (Nedić et al., 2015; Seberová et al., 2020), focusing the student on certain task characteristics (Gunawardena et al., 2017; Panselinas & Komis, 2009), supportive parents (Goodall, 2020), using a language that the student understands, or using technical tools that facilitate various task-related activities (Fernández et al., 2001; Mercer, 2000). Sociocultural

[1] All references to Kosovo in this document should be understood to be in the context of United Security Council resolution 1244 (1999).

theorists point out that the dynamics of learning are largely determined by the variety of tools that a culture has at its disposal and the environment in which the development process takes place (Cole & Wertsch, 1996; Vygotsky, 1934, 2012). Some of these dynamics relate to cultural tools as mediators of learning, such as laboratories, libraries of graphic displays, and software programs installed on electronic devices (such as tablets and computers), which can drastically change the learning process (Kozulin, 2003). In the educational context, there are numerous examples of support, such as asking students constructive questions, using tools that can lead to more meaningful learning, and teaching students how to communicate their thoughts (Fernández et al., 2001; Mercer, 2000; Mercer & Littleton, 2007; Radišić & Jošić, 2015).

The extent to which the school emphasizes the importance of student academic success is one of the school factors underpinning student achievement (Goddard et al., 2000; Hoy et al., 1991). Setting high, but achievable goals in terms of student achievement leads to the establishment of an orderly and effective learning environment and motivates students to work and achieve better results.

The size, location, and learning resources of the school may affect the efficiency of the school as a system. Equipped with all the necessary elements (library, gymnasium, and laboratory), smaller schools are usually more effective, providing a safe and intimate learning environment (Klonsky, 2002; Wasley et al., 2000). However, research into the importance of school resources for achievement has proved inconsistent; some studies found that these resources are not critical to student success (Hanushek, 1997), while others reported that the amount of money spent by a school per student was a strong predictor of achievement (Hedges et al., 1994). For the efficient use of information technologies, employee training is certainly necessary (Fraillon et al., 2020; Laffey et al., 2003).

All these types of scaffolds can support different subjects, such as science or mathematics (Dawes, 2008; Mercer et al., 2004). The scaffolding concept can also be useful as an analytical tool to help gain a greater understanding of teaching and learning in schools at different levels of urbanization.

1.2 Urban and Rural Schools in the Dinaric Region

Defining the terms urban and rural is a rather challenging task because there does not seem to be one unambiguous answer that permits a universally understood definition to be assigned. Historically, the term rural meant something that was "outside the city walls." From the economic aspect, rural territory is used to produce, above all, food, while sociologists might characterize the rural environment as more technologically and culturally backward in development terms than an urban environment. Today, various criteria are used to analyze rural and urban concerns, such as demographic criteria, the amount and structure of the population's income, location criteria and measures of basic activity of inhabitants in a certain territory. Rural areas are thus characterized as sparsely populated places, places where people have

lower incomes, and areas that have a different purposes from urban areas, primarily dominated by agricultural land that often defines the activities and professions of inhabitants. TIMSS 2019 created general international definitions of rural and urban that were based on the number of inhabitants in the region in which the school was located, but subcategories of urbanization were more precisely defined by population sizes for cities, towns, and villages in each education system (Mullis & Martin, 2017).

Students in schools in urban and more economically developed environments often demonstrate higher achievement. This may be related to the availability of better teaching staff, better local community resources, or higher socioeconomic status (SES) of families in many urban classrooms (Darling-Hammond, 1996; Erberber, 2009; Hooper et al., 2013; Mohammadpour & Abdul Ghafar, 2014; Piyaman et al., 2017). The relations between achievement and learning environment in urban and rural schools are also reflected in the education systems across the Dinaric region. For instance, in Serbia, results from the national test in mathematics and Serbian language in 2004 showed grade three students from urban areas achieved higher scores than their peers in rural schools (Baucal et al., 2007). The results also showed that differences in achievement between students from rural and urban schools could be mostly explained by their social background and different preparation for starting school, and only to a smaller extent by variance in the quality of mathematics teaching in rural and urban schools. Serbia and Albania showed similar urban–rural gaps in reading scores on the Programme for International Student Assessment 2018 (PISA) of about 45 points (OECD [Organisation for Economic Cooperation and Development], 2019).

According to a report by the United Nations Children's Fund in Bosnia and Herzegovina (UNICEF, 2020) into the situation of children in Bosnia and Herzegovina, about 60% of young people under the age of 18 lived in rural areas, but children in rural areas made up only 0.5% of the total number of children attending preschool education. Data on student achievement for rural areas are inconsistent. On the one hand, results from the 2011 Labour Force Survey (Somun-Krupalija, 2011) for the whole of Bosnia and Herzegovina and their Survey of Rural Households in 2012 (which included people living outside urban settlements; Goss, 2012) showed that the population of Bosnia and Herzegovina that lived in the countryside tended to be less educated than its urban inhabitants. Rural residents received, on average, two years less education than those in urban areas, regardless of gender (Goss, 2012). On the other hand, the reports of United Nation Development Programme (UNDP) about rural development (UNDP, 2013) as well as the Multiple Indicator Cluster Survey report (The Agency for Statistics of Bosnia and Herzegovina et al., 2013) found that the education in rural areas is improving. Villagers were becoming less disadvantaged in terms of formal education because most manage to send children in school despite the distance and the total number of children in Bosnia and Herzegovina attending high school has increased significantly, from 74% in 2006 to 92% in 2011/12 (UNDP, 2013). We caution that differences in reported statistics arise from their different focus, but also from the methodology of defining rural areas by cantons in Bosnia and Herzegovina.

Regardless of the interpretations of the fairness of education in different environments, all reports agree that the extremely complex administrative organization of the education system in the region makes it difficult to harmonize regulations on education and service delivery, especially in rural areas. Variance in preschool education across the different regions was also noted in North Macedonia, where about 32% of 0–5 year olds attended preschool education in the East and Pelagonia regions, but only eight percent in the Northeast region (World Bank, 2019). Data for North Macedonia shows that the total enrollment of children in education in rural areas was lower than in urban areas (Eftimoski, 2006).

The socioeconomic background of students from different regions is generally related to levels of education across all the Dinaric systems that participated in TIMSS. The UNDP report for 2019 (Conceição, 2019) showed that some territories face regional differences in the level of development, as measured by the UNDP's human development index, which includes an education index (EI) as one of the indicators of human development. The EI was composed of the average adult's number of years of schooling and the expected number of years of schooling for children in the region, each receiving a 50% weighting. Capital cities, like Tirana in Albania and Belgrade in Serbia, had higher EIs than other areas, showing that there were clear differences between urban and rural regions (Baucal et al., 2007; Vujnić, 2014; World Bank, 2019). A World Bank (2019) report on the effects of urbanization in Albania, Bosnia and Herzegovina, Croatia, Kosovo, North Macedonia, Montenegro, and Serbia, using data on educational inputs, suggested that regions with lower EIs were often well resourced. For example, relative to their populations, regions like Diber and Kukës in Albania had more schools and teachers and smaller classes than many more affluent regions. This partially reflects an explicit effort to ensure access to education regardless of where people live, but also reveals the demographic decline in rural areas; schools remain, but declining populations mean fewer students attend (World Bank, 2019).

A search of the literature revealed that education systems in the Dinaric region recognize dichotomous classification (urban/rural) and generally use the number of inhabitants as the classification criteria, so this was a logical choice for our research (see, e.g., Gajić, 2015; Milanović et al., 2010; Miljević-Riđički et al., 2011; Rajovic & Bulatovic 2015; Somun-Krupalija, 2011). Data collected by TIMSS 2019 provided important information about education in schools at different urbanization levels. The TIMSS 2019 contextual framework classified school location using five categories: urban, suburban, medium-sized city or large town, small town or village, and remote rural; each category was contextualized using relevant national definitions of population size (Mullis & Martin, 2017). Based on previous research into an earlier cycle of TIMSS in 2015 (see Boulifa & Kaaouachi, 2015; Webster & Fisher, 2000), for our analyses we merged the first three categories into one signifying urban areas and the other two into one signifying rural areas. We used this simplified type of classification because this enables us to obtain comparable data on schools from different education systems with nationally defined numeric criteria for urban locations. More detailed information about the Dinaric education systems can be found

in chapter "Introduction to Dinaric Perspectives on TIMSS 2019" and in the TIMSS 2019 encyclopedia (Kelly et al., 2020).

1.3 Scope of the Chapter

Policymakers across the Dinaric region are interested in learning whether all students have equal access to education and whether all children have equal learning support (Boljka et al., 2018; European Commission, 2014; Krstevska & Trenceva, 2016; UNDP, 2013; OECD, 2019). The dilemma that immediately arises when considering schools in rural areas is their cost-effectiveness over educational effectiveness. In particular, the enduring question is whether schools in rural areas should be supported by national funding or whether their funding should be reduced by placing students in schools in more urban areas, while subsidizing the additional travel costs to enable students from more distant locations to attend.

Our work was guided by three key research questions:

(1) *Do schools from different urbanization levels (urban and rural) differ in other defined ways (for example, school size)?*
(2) *Do urban and rural schools differ in terms of their student achievement?*
(3) *Do urban and rural areas differ in terms of the types of scaffolding available to support student learning in schools?*

2 Data and Methods

We analyzed TIMSS 2019 data from across the Dinaric region, collected from grade four students, their parents, and their school principals (for more information, see TIMSS & PIRLS International Study Center, 2018). All the variables that we used in our analyses are available in the TIMSS international database (Table 1). We used TIMSS data for mathematics and science achievement at grade four to document the achievement gaps between schools in urban and rural areas and as outcome variables in regression models. We calculated percentages, means and regression models, and used *t*-test statistics to determine statistical group differences (for a detailed description of the data sources, methods, and procedures used in our analyses, please see Sect. 5).

As part of the TIMSS school questionnaire, principals were asked to assess the level of urbanization of the area in which their school was located. As already mentioned, we derived the categories of urban and rural that we used in our analyses from the five internationally defined categories (see Table S.17 in the supplementary materials available for download at www.iea.nl/publications/RfEVol13 for disaggregated results).

To investigate the reasons for the differences in the achievement of students in relation to the type of school, we analyzed a variety of home and school support for

Table 1 List of variables and scales used in our analyses

Variable/Scale	Description	Values/Response options	References
School location	Principals' responses to the question, which best describes the immediate area in which your school is located? Response options: urban (densely populated), suburban (on fringe or outskirts of urban area), medium size city or large town, small town or village, remote rural	School location was recoded into two categories: (1) Urban (urban, suburban, medium city) (2) Rural (small town, remote rural)	Fishbein et al. (2021, Supplement 1, p. 95)
School size	Total enrollment of students in school, as reported by principals	Number of students	Fishbein et al. (2021, Supplement 1, p. 95)
School composition by socioeconomic background	Principal's report on the share of students in the school coming from: (a) Economically disadvantaged homes (b) Economically affluent homes Response options: 0–10%, 11–25%, 26–50%, more than 50%	Index with three categories: (1) More affluent: schools where more than 25% of the student body comes from economically affluent homes and not more than 25% from economically disadvantaged homes (2) More disadvantaged: schools where more than 25% of the student body comes from economically disadvantaged homes and not more than 25% from economically affluent homes (3) Neither more affluent nor more disadvantaged: all other possible response combinations	Fishbein et al. (2021, Supplement 3, p. 19)

(continued)

Table 1 (continued)

Variable/Scale	Description	Values/Response options	References
Schools where students enter the primary grades with literacy and numeracy skills scale[a]	The scale is based on principals' estimates on how many students had each of the twelve different literacy and numeracy skills when entering the first grade of primary school	Higher values mean more students entered school with more established basic literacy and numeracy skills	Yin and Fishbein (2020, p. 16.131)
Home resources for learning scale[a]	Based on students' and parents' reports regarding the availability of five resources: • Number of books in the home (students) • Number of home study support (students) • Number of children's books in the home (parents) • Highest level of education of either parent (parents) • Highest level of occupation of either parent (parents)	Higher values mean more home resources for learning This scale was divided using scale cut scores into an index with three categories[†]: (1) Many resources (2) Some resources (3) Few resources	Yin and Fishbein (2020, p. 16.39)
School emphasis on academic success scale[a]	The scale is based on thirteen items that measure the principal's perception of students', parents' and teachers' focus on student achievement	Higher values represent more emphasis	Yin and Fishbein (2020, p. 16.124)
Grade four student:computer ratio	The ratio between the number of grade four students in schools and number computers available for the use of grade four students at school	Number of students sharing one computer	Fishbein et al. (2021, Supplement 1, p. 95 and p. 97)

(continued)

Table 1 (continued)

Variable/Scale	Description	Values/Response options	References
Single items related to school resources	Principals' reports on: • Access to digital learning resources • Use of online learning management system • Availability of science laboratory • Availability of assistance for science experiments • Availability of a school library (if available, does it have 2000 books or less or more than 2000 books) • Availability of classroom library	Response categories (1) Yes (2) No	Fishbein et al. (2021, Supplement 1, p. 97)

Notes [a]These TIMSS scales are constructed so that the scale center point of 10 is located at the mean score of the combined distribution of all TIMSS 2019 grade four participants. The units of the scale are chosen so that the standard deviation of the distribution corresponds to two scale score points

[†]For more general information on scale construction, scaling methodology, and scale cut scores, please see Martin et al. (2020). The references provide information on exact item wording and, in the case of latent scales, some additional information (Cronbach's alpha reliability coefficients, principal component analysis of the included items, relationships between the scale and student achievement). Descriptive statistics of continuous variables are available in Table S.16 in the supplementary materials available for download at www.iea.nl/publications/RfEVol13

students, and the availability of material resources at schools, such as laboratories, libraries, and technology equipment. To assess the level of home support, we used principals' reports of student readiness for schooling and the TIMSS scale home resources for learning, and to assess the level of school support, we analyzed school emphasis on academic success and school material resources.

Students differ in the degree to which they know how to read, write and count when entering grade one. To indirectly measure how prepared students are when starting school, TIMSS asks their principals to estimate how much students know on entering school. The TIMSS scale "Schools where students enter the primary grades with literacy and numeracy skills" combines principals' responses to several items on the school questionnaire to provide a measure of students' readiness for schooling. Another factor that may mediate the effect of urbanization could be differences in parental support for schooling. The TIMSS "Home resources for learning" (HRL) scale attempts to measure this by combining student responses from the student questionnaire and the responses of their parents/guardians from the early years questionnaire to statements related to resources that are available in the home learning environment. To assess school scaffolding, we focused on two sets of data in the TIMSS database. The first was the TIMSS scale "School emphasis on academic success," (SEAS) which combines principals' responses to a number of items designed to measure their perceptions of the school community's focus on student achievement. The second was the principals' assessments of school material resources, such as availability of technology equipment, laboratories, and libraries. As an additional assessment of the material resources that may be available to students in schools, we also investigated the student: computer ratio in the grade four classrooms, the availability of online learning management systems (OLMSs), and access to digital resources in school.

To better understand how all these factors were related to student achievement, we undertook regression analyses to predict mathematics and science achievement based on the urbanization level of schools, and the home resources for learning and school emphasis on academic success scales.

3 Results

3.1 Allocation and Size of Schools in Urban and Rural Areas

We found that the percentages of urban and rural schools and the percentages of students in these schools varied across the Dinaric region (Table 2). In Albania, Croatia, Kosovo, and Serbia, about a third of schools were located in urban areas. In Bosnia and Herzegovina and North Macedonia, slightly less than half of schools were located in urban areas, while, in Montenegro, more than half of schools were located in urban areas. Regarding the percentages of students in schools by location, Montenegro reported that around 85% of students were enrolled in schools in urban

Table 2 Percentage of schools and students in schools by urbanization of location area of the school

Education system	Schools in urban areas (%)		Students in urban areas (%)		Schools in rural areas (%)		Students in rural areas (%)	
Albania	35	(3.3)	63	(2.9)	65	(3.3)	37	(2.9)
Bosnia & Herzegovina	44	(3.0)	60	(3.2)	56	(3.0)	40	(3.2)
Croatia	36	(5.0)	57	(3.3)	64	(5.0)	43	(3.3)
Kosovo[a]	32	(4.1)	57	(3.2)	68	(4.1)	43	(3.2)
Montenegro	55	(2.9)	85	(0.5)	45	(2.9)	15	(0.5)
North Macedonia	44	(2.6)	64	(3.3)	56	(2.6)	36	(3.3)
Serbia[a]	36	(5.7)	68	(3.0)	64	(5.7)	32	(3.0)

Notes Standard errors appear in parentheses
[a]National defined population covers 90–95% of the national target population

areas, while, in most of the other participating education systems, at least a third of students attended schools in rural areas.

There were large differences in the average numbers of enrolled students, both in total and at grade four, between urban and rural schools in all participating systems (Fig. 1). Schools in urban areas had significantly more students than those in rural areas. However, these size differences vary across the Dinaric region. In Kosovo, urban schools were, on average, three times as large as rural schools, and, in

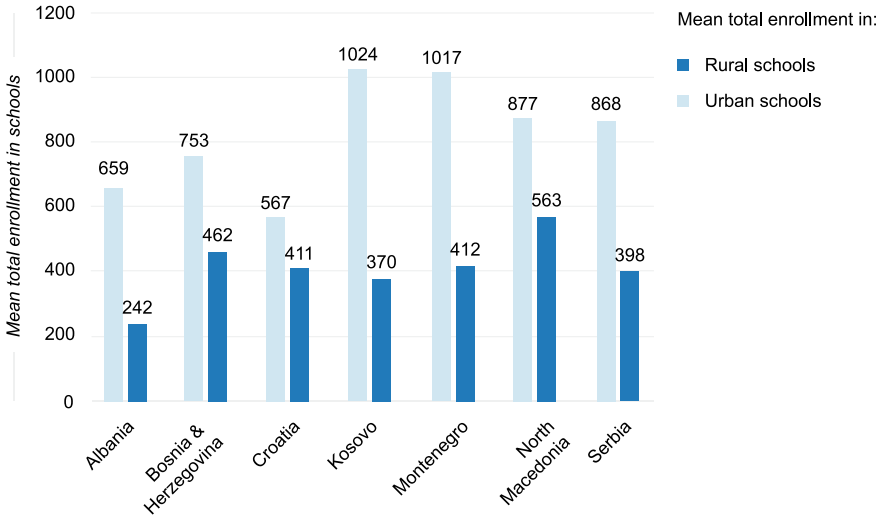

Fig. 1 School size (mean total enrollment) of urban and rural schools
Note In Kosovo and Serbia, the national defined population covers 90–95% of the national target population

Montenegro, urban schools were about twice as large as rural schools; Croatia showed the smallest difference in school size by area (for in depth comparisons of average school size indicators by urbanization level, see Table S.18 in the supplementary materials available for download at www.iea.nl/publications/RfEVol13).

We used the variable school composition by socioeconomic background to categorize schools into three groups according to the number of enrolled students with different socioeconomic background. Across most of the Dinaric region, there were more students in more affluent schools in urban areas; the exception was Kosovo (Fig. 2). In North Macedonia and Croatia, more than 60% of students in urban schools attended more affluent schools. Conversely, rural schools were more likely to be more disadvantaged than urban schools. There was more variation within the group of school that were categorized as neither more affluent nor more disadvantaged; it is worth noting that, in North Macedonia, just five percent of students in urban areas were in this intermediate category of schools, suggesting severe social segregation existed in these urban areas.

As schools from different regions differ in terms of the socioeconomic background of their student bodies, teachers and schools in different regions experience different work conditions. Some teachers work in classes containing many students from economically affluent homes, while others work in classes where many students come from economically disadvantaged homes.

3.2 Students Achievement in Urban and Rural Areas

As our focus was on identifying the differences between urban and rural areas rather than across the region, we limited comparisons to the differences between the mean mathematics and science achievement among students in urban and rural schools, which we term the urban–rural achievement gap (Fig. 3).

First, we must note that there were statistically significant differences in student achievement depending on the urbanization of the student's school area across the whole of the Dinaric region. Students in urban schools had consistently higher mean achievement in mathematics and science than their peers in rural schools. The only exception was in Montenegro, where there was no difference in the mean achievement of students in schools of different urbanization levels in mathematics, although there was a difference for science. The biggest urban–rural achievement gaps were in Serbia and North Macedonia, in both mathematics and science; in both, the mean achievement of students in urban schools was 36–45 points higher than students attending rural schools. The achievement gaps in Albania and Kosovo were much smaller for both subjects, 18 and 25 points, respectively. Bosnia and Herzegovina, Croatia, and Montenegro formed a third group where mean achievement gaps for both subjects were less than 15 points, although still significant.

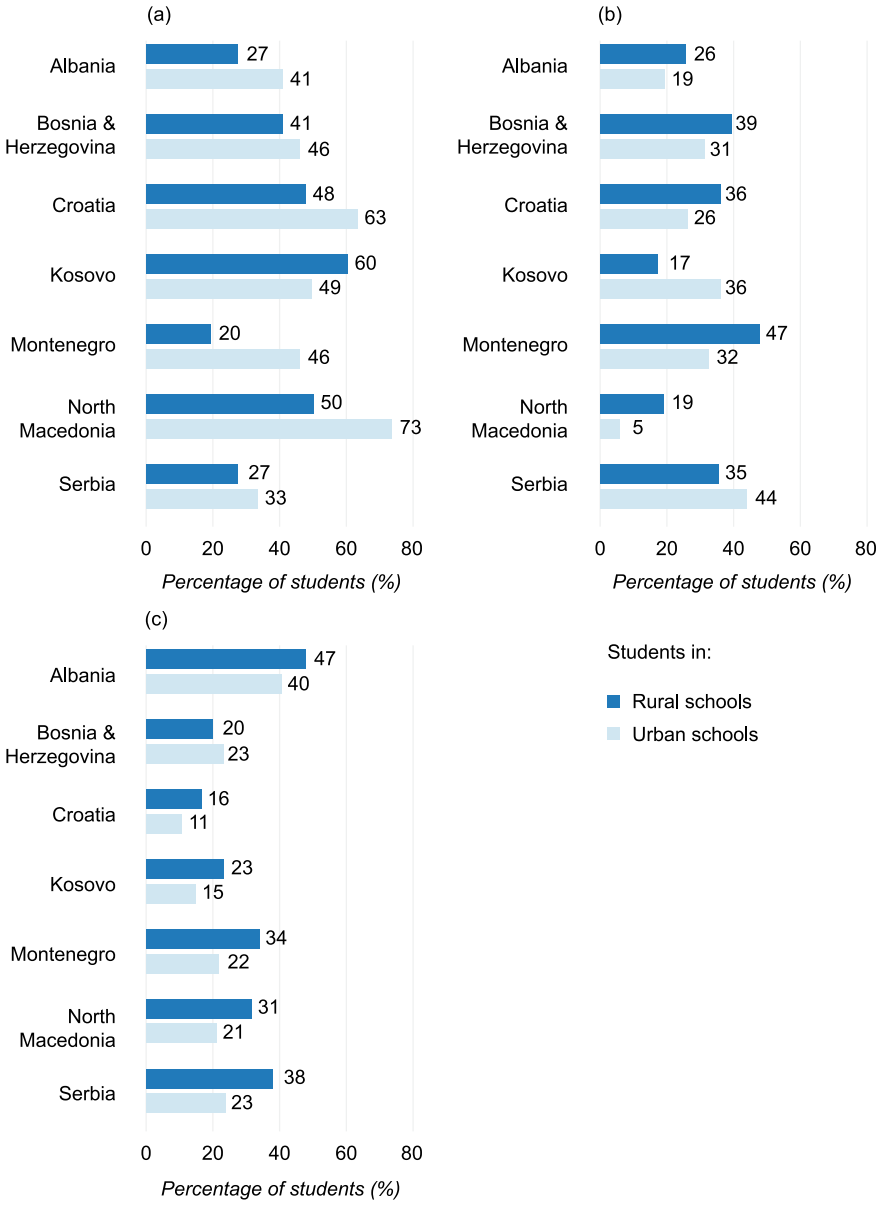

Fig. 2 Percentage of students in urban and rural schools by socioeconomic background of the student body

*Note*s Percentages add up to 100% for urbanization levels, allowing direct comparisons within and across economic groups. In Kosovo and Serbia, the national defined population 90–95% of the national target population. In Kosovo, data are available for ≥50% but <70% of students. (a) more affluent; (b) neither more affluent nor more disadvantaged; and (c) more disadvantaged

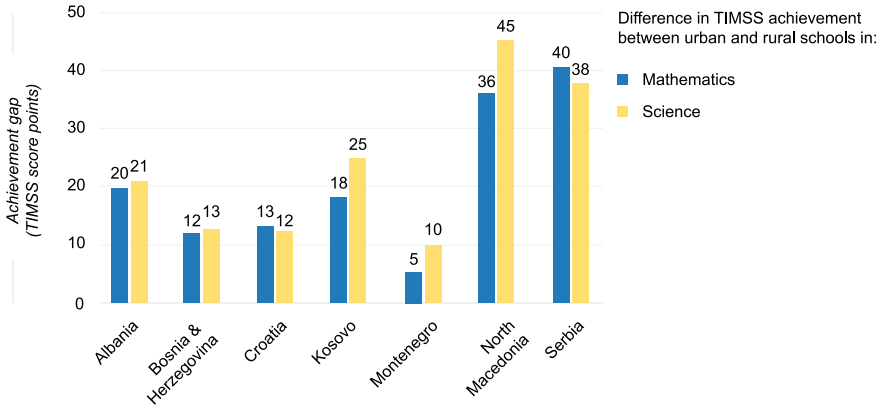

Fig. 3 Achievement difference in mathematics and science between urban and rural areas
Notes Positive values mean scores in urban areas were larger. Differences were statistically significant ($p < 0.05$) in all but in Montenegro for mathematics. In Kosovo and Serbia, the national defined population covers 90–95% of the national target population

3.3 Urbanization and Different Kinds of Learning Supports for Students

Home Scaffolding

We used a TIMSS scale based on principals' estimates of the percentage of students in the school who possessed a range of literacy and numeracy skills when beginning primary school (the schools where students enter the primary grades with literacy and numeracy skills scale) as a measure of students' readiness for schooling. Comparing data for rural and urban schools in the seven Dinaric participants, we found that, in general, there were few statistically significant differences in readiness for school across the region. Statistically significant differences were only found in Montenegro and Serbia, where the data showed that, according to the principals, more students entering school with literacy and numeracy skills in urban schools than in rural schools; the differences were more pronounced in Serbia.

As a further indicator of the effects of urbanization, we analyzed differences in mean scores on the HRL scale; these were statistically significant for all participants (Fig. 4). This means that students in rural schools had, on average, fewer home resources (such as books, desks, their own room, and internet access) and less educated parents with lower occupational levels than their peers in urban schools. The differences the mean scores were largest in Albania, Serbia, and North Macedonia.

School Scaffolding

In general, according to principals' reports, schools across the Dinaric region placed a high emphasis on academic success (Fig. 5). However, there were statistically significant differences between schools in urban and rural areas in Croatia, Montenegro,

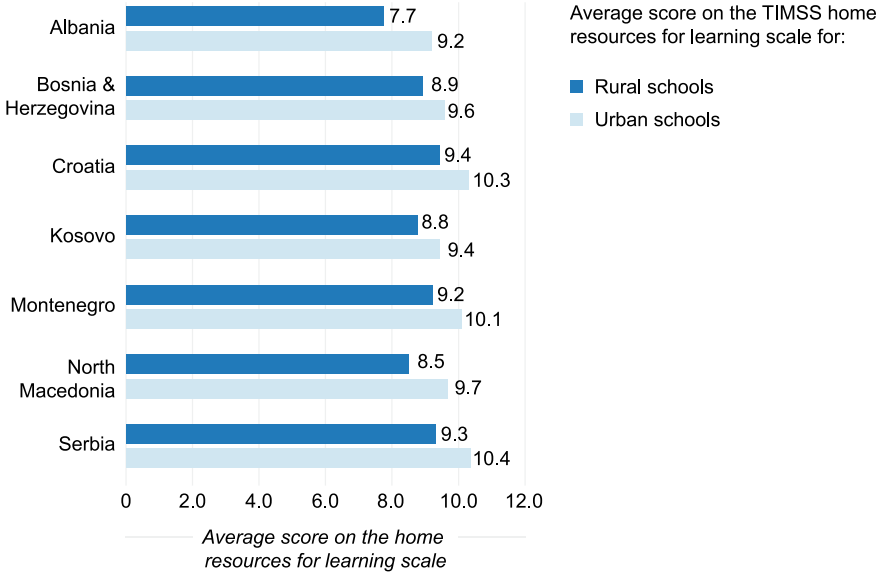

Fig. 4 Mean scores on the TIMSS scale home resources for learning for groups of urban and rural schools

Notes In Kosovo and Serbia, the national defined population covers 90–95% of the national target population. In Montenegro, data are available for ≥70% but <85% of students

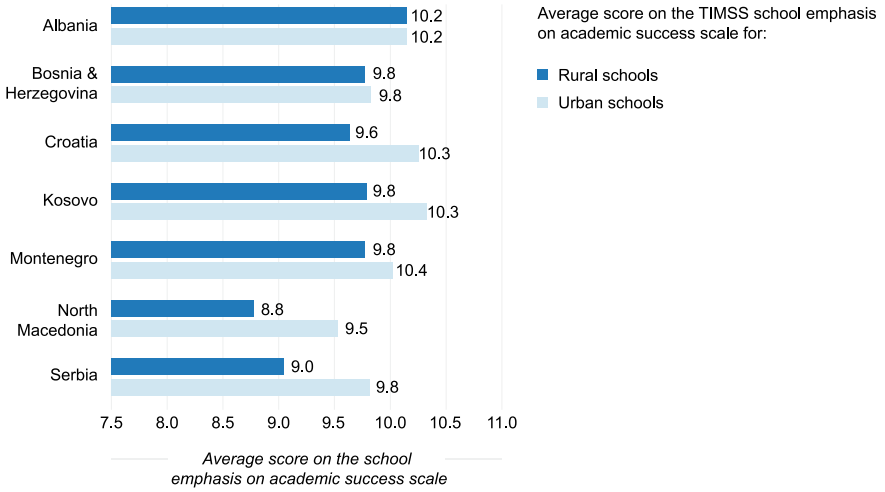

Fig. 5 Mean scores on the TIMSS scale school emphasis on academic success for groups of urban and rural schools

Note In Kosovo and Serbia, the national defined population covers 90–95% of the national target population

and Serbia. In all three of these systems, principals of urban schools tended to report higher levels of emphasis on academic success in their school community than principals of rural schools.

Our investigation of the additional material resources that may be available to students in schools, showed that the difference between percentages of students enrolled in urban and rural schools where an OLMS was available was only significant in Albania, where 19% of students in urban schools and only seven percent of students from rural schools had access to OLMSs. For the remainder of the Dinaric participants, urban and rural schools this indicator did not differ, nonetheless, the total percentage of schools using an OLMS varied across the Dinaric region (see Table S.19 in the supplementary materials available for download at www.iea.nl/publications/RfEVol13). In Albania and Kosovo, there were only low percentages of students in schools that had an OLMS, while Serbia, North Macedonia, and Croatia reported higher percentages of students were in school that had access to an OLMS.

Our assessment of the availability of technology for students in school and whether this availability differed in relation to school urbanization indicated that, overall, schools in the region were not well equipped with computers and there was considerable variation regarding availability to students (Fig. 6; see Table S.19 and S.20 in the supplementary materials available for download at www.iea.nl/publications/RfEVol13). While in most of the Dinaric education systems, there was one computer for approximately every 10 students, the availability of computers was noticeably lower in urban schools in Kosovo. In North Macedonia, a computer was shared between four students in urban schools and between two students in rural schools. The student:computer ratio was lower in urban than rural schools in Albania, Croatia, Kosovo, and North Macedonia. Kosovo had more computers per student in rural schools than in urban schools, suggesting that they had invested in providing this type of additional school scaffolding to rural communities. Access to digital resources was also inconsistent for students in Albania, Kosovo, and Montenegro, where the percentage of students in schools with access to digital resources was higher in urban than in rural areas.

Laboratories

Overall, data for schools that had a laboratory and provided assistance for conducting science experiments showed that there were few significant differences (Table 3). Students in urban schools in Albania had greater access to laboratories (26%) and were provided more assistance with conducting science experiments (21%) then their peers in rural schools (5% and 6%, respectively). Conversely, in Montenegro, a larger percentage of students in rural schools had access to laboratories (28%) and assistance with conducting science experiments (50%) than their peers in urban schools (20% and 23%, respectively). While Serbia reported no significant differences between urban and rural schools regarding the availability of laboratories, there was a significant difference in the availability of assistance for conducting science experiments. In urban schools 39% of students received this kind of support during teaching, while only 19% of students in rural schools had this support.

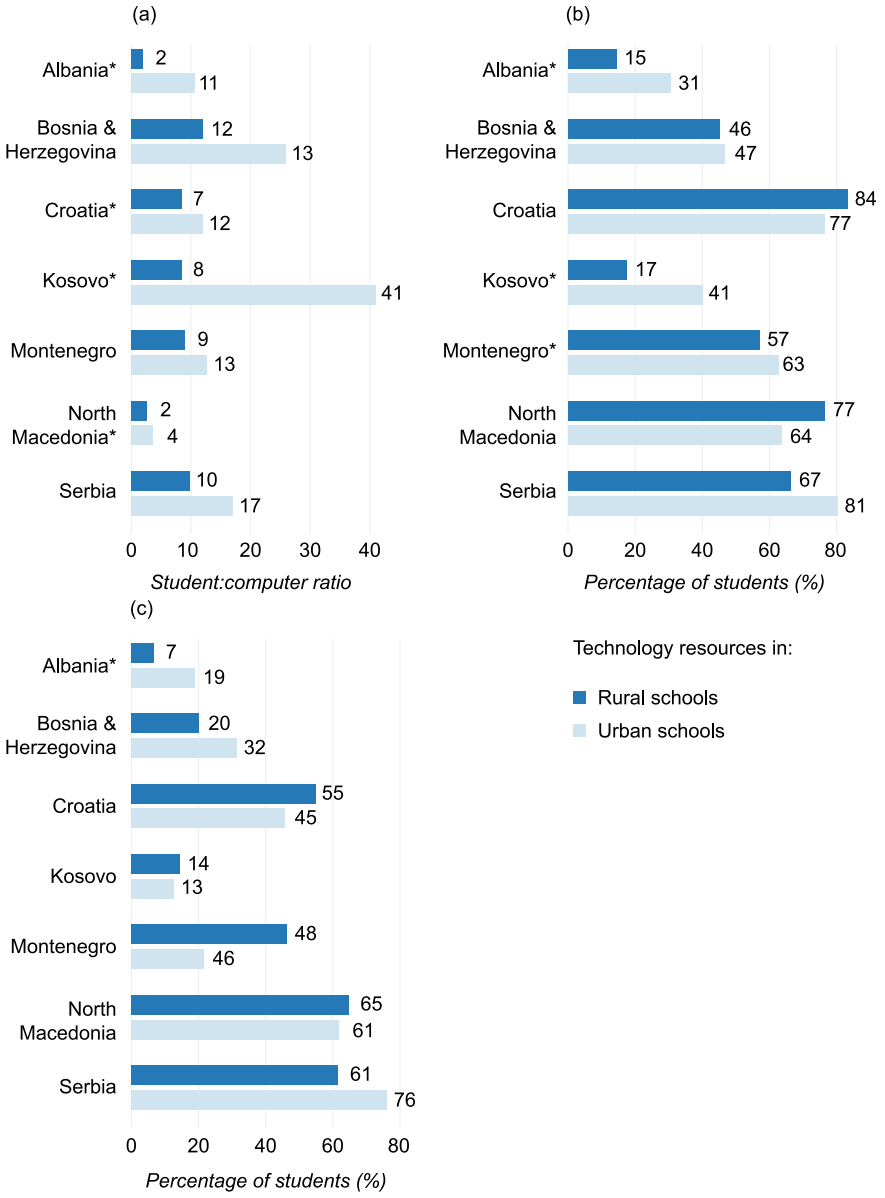

Fig. 6 Assessment of technology resources in urban/rural schools: **a** the average student:computer ratio in grade four classrooms; **b** percentage of students that had access to digital resources in school; and **c** percentage of students in schools that had access to an online learning management system *Notes* In Kosovo and Serbia, the national defined population covers 90–95% of the national target population. *differences were statistically significant ($p < 0.05$)

Table 3 Percentages of students in schools with a science laboratory and in schools that provide assistance for conducting science experiments

Education system	Percentage of students in schools where a science laboratory is available			Percentage of students in schools where assistance for conducting science experiments is available		
	Urban	Rural	Difference	Urban	Rural	Difference
Albania	26 (3.6)	5 (2.7)	**21** (4.9)	21 (4.2)	6 (2.5)	**15** (4.8)
Bosnia & Herzegovina	19 (4.8)	7 (3.2)	12 (6.6)	24 (4.8)	28 (5.7)	−5 (7.8)
Croatia	6 (2.7)	6 (3.6)	0 (4.5)	15 (3.7)	15 (4.8)	0 (6.0)
Kosovo[a]	24 (6.2)	14 (4.5)	10 (7.9)	14 (4.5)	8 (3.7)	6 (5.7)
Montenegro	20 (0.3)	28 (1.2)	**−8** (1.2)	23 (0.4)	50 (2.1)	**−27** (2.1)
North Macedonia	4 (2.2)	9 (3.9)	−5 (4.3)	38 (5.1)	25 (6.4)	14 (8.4)
Serbia[a]	11 (2.9)	10 (3.6)	1 (4.4)	39 (5.4)	21 (5.8)	**18** (7.7)

Notes Statistically significant ($p < 0.05$) differences are shown in bold. Standard errors appear in parentheses

[a]National defined population covers 90–95% of the national target population

Libraries

When comparing the availability of school libraries in urban and rural schools, we found only Kosovo and Northern Macedonia showed significant differences (Table 4). In Kosovo, 90% of students in urban schools had access to a school library, while this percentage was lower for students in rural schools (73%). A slightly smaller percentage difference occurred in North Macedonia, where all students in urban schools had libraries compared to only 89% of students in rural schools.

Some schools reported having large libraries, containing more than 2000 books; for this factor the differences were only significant in Albania and North Macedonia. In Albania, 28% of students attending urban schools had access to large libraries, while only one percent of students in rural schools had similar resources. Data for North Macedonia indicated that large 76% of students in urban schools had access to large school libraries, compared to only 51% of students in rural areas.

Classroom libraries were available for small percentages of students in all seven TIMSS participants, but the urban–rural difference was only significant in Kosovo and Montenegro. In urban schools, 16% of students in Kosovo and 18% of students in Montenegro had classroom libraries; the comparable figures for rural schools were three percent of students in Kosovo and 11% of students in Montenegro.

3.4 Student Achievement in Urban and Rural Areas Regarding the Type of Scaffolding

To better understand how all these factors were related to student achievement, we undertook regression analyses to predict mathematics and science achievement from

Table 4 Percentages of students in schools with a library

Education system	Percentage of students in schools where a school library was available			Percentage of students in schools where the library had >2000 books			Percentage of students in schools where classroom libraries were available		
	Urban	Rural	Difference	Urban	Rural	Difference	Urban	Rural	Difference
Albania	96 (2.1)	92 (3.8)	4 (4.2)	28 (4.5)	1 (1.5)	**26** (4.8)	22 (4.2)	13 (5.2)	9 (6.4)
Bosnia & Herzegovina	100 (0.0)	100 (0.1)	0 (0.1)	84 (4.0)	75 (5.2)	9 (6.1)	5 (2.5)	3 (2.0)	2 (3.2)
Croatia	100 (0.0)	98 (2.2)	2 (2.2)	79 (4.9)	75 (6.5)	4 (8.5)	11 (3.6)	6 (3.6)	5 (5.1)
Kosovo[a]	90 (3.7)	73 (5.4)	**16** (6.5)	24 (7.0)	13 (4.7)	10 (8.9)	16 (4.4)	3 (2.2)	**13** (5.0)
Montenegro	100 (0.0)	100 (0.0)	0 (0.0)	85 (0.2)	85 (0.7)	0 (0.8)	18 (0.4)	11 (0.5)	**7** (0.6)
North Macedonia	100 (0.0)	89 (3.8)	**11** (3.8)	76 (5.0)	51 (7.7)	**25** (8.9)	26 (5.2)	16 (6.1)	10 (7.9)
Serbia[a]	100 (0.0)	92 (4.1)	8 (4.1)	87 (3.4)	81 (6.3)	6 (7.5)	9 (2.7)	2 (2.2)	6 (3.5)

Notes Statistically significant ($p < 0.05$) differences are shown in bold. Standard errors appear in parentheses
[a]National defined population covers 90–95% of the national target population

Table 5 Amount of variance in student mathematics achievement by school location, the home resources for learning scale (HRL) and the school emphasis on academic success scale (SEAS)

Education system	Number of students (n)	Variance (R^2) explained by model	Standardized regression coefficients					
			Urbanization		SEAS		HLR	
Albania	3986	0.17	−0.03	(0.05)	**0.13**	(0.04)	**0.38**	(0.03)
Bosnia and Herzegovina	5260	0.12	0.00	(0.03)	−0.02	(0.03)	**0.35**	(0.02)
Croatia	3684	0.13	−0.01	(0.03)	0.01	(0.03)	**0.36**	(0.03)
Kosovo[a]	4256	0.09	0.04	(0.04)	**0.09**	(0.03)	**0.27**	(0.02)
Montenegro	4325	0.13	**−0.05**	(0.02)	−0.01	(0.02)	**0.37**	(0.01)
North Macedonia	2685	0.23	0.01	(0.05)	0.06	(0.05)	**0.45**	(0.02)
Serbia[a]	4184	0.27	**0.06**	(0.03)	0.05	(0.03)	**0.49**	(0.02)

Notes To assess the urbanization level of schools, we coded rural schools as 0 and urban as 1. R^2 = the proportion of variance in the outcome variable that is explained by the set of predictor variables. Statistically significant ($p < 0.05$) regression coefficients are shown in bold. Standard errors appear in parentheses

[a]National defined population covers 90–95% of the national target population

the urbanization level of schools, home resources for learning scale scores, and the school emphasis on academic success scale scores (where higher values mean more home resources were available and the school placed greater emphasis on academic success) (Tables 5 and 6).

The three predictors together explained between nine and 27% of variance in achievement across the Dinaric region, which is a remarkable amount given the many factors that potentially affect student achievement. Home resources for learning was a significant predictor for all participants after controlling for urbanization and school emphasis on academic success. While school emphasis on academic success was a significant predictor of grade four students' mathematics and science achievement in Kosovo and Albania, the urbanization level of the school was only significant for mathematics achievement and only in Montenegro and Serbia. Nevertheless, all these significant coefficients were rather low, and, after controlling for school emphasis on academic success and home resources for learning, the difference in achievement scores between urban and rural schools disappeared. In other words, differences in student achievement between urban and rural schools seem to be largely determined by the students' backgrounds, and these may vary considerably according to the urbanization of the area surrounding the school.

Table 6 Amount of variance in student science achievement by school location, the home resources for learning scale (HRL) and the school emphasis on academic success scale (SEAS)

Education system	Number of students (n)	Variance (R^2) explained by model	Standardized regression coefficients:					
			Urbanization		SEAS		HLR	
Albania	3986	0.16	−0.01	(0.05)	**0.14**	(0.04)	**0.36**	(0.03)
Bosnia and Herzegovina	5260	0.10	0.01	(0.03)	−0.01	(0.03)	**0.31**	(0.02)
Croatia	3684	0.13	−0.01	(0.03)	0.02	(0.03)	**0.37**	(0.02)
Kosovo[a]	4256	0.10	0.07	(0.04)	**0.11**	(0.03)	**0.26**	(0.03)
Montenegro	4325	0.14	−0.03	(0.02)	−0.01	(0.02)	**0.38**	(0.02)
North Macedonia	2685	0.25	0.04	(0.05)	0.08	(0.05)	**0.46**	(0.03)
Serbia[a]	4184	0.27	0.06	(0.03)	0.05	(0.03)	**0.49**	(0.02)

Notes To assess the urbanization level of schools, we coded rural schools as 0 and urban as 1. R^2 = the proportion of variance in the outcome variable that is explained by the set of predictor variables. Statistically significant ($p < 0.05$) coefficients are shown in bold. Standard errors appear in parentheses

[a]National defined population covers 90–95% of the national target population

4 Discussion

International studies have noted differences in educational achievement between urban and rural schools, generally in favor of the urban schools (see e.g., Mohammadpour & Abdul Ghafar, 2014; Piyaman et al., 2017; Wasley et al., 2000). We aimed to identify variables which could enhance understanding of differences between urban and rural schools. We analyzed any differences and similarities between these two groups of schools in Dinaric region and analyzed the type and quality of the scaffolding for learning that students received from both home and school.

Our comparisons confirmed that urban and rural schools tended to have different demographic structures. In all seven participating systems, there were more students in total and more grade four students enrolled in urban schools than rural schools. Not only were there fewer students enrolled in rural schools, but these schools are also smaller. We also analyzed principals' reports of the percentage of enrolled students that came from homes with different socioeconomic situations. The data revealed that, in general, the percentages of students enrolled in the schools categorized as more affluent tended to be higher in urban areas than in rural areas.

Students' TIMSS achievement scores can usually be attributed to a combination of factors, including factors related their family background, and other school- or teacher-related factors. We wanted to establish whether the support that comes with these factors differed between urban and rural areas. At the family level, we assessed variables related to student readiness for schooling and home resources for learning. In general, scaffolding in learning measured by scores on the schools where students

enter the primary grades with literacy and numeracy skills scale did not appear to differ substantially between urban and rural schools; students in five out of the seven participating systems tended to achieve similar mean scores in both urban and rural schools. However, in Montenegro and Serbia, principals of students in urban areas tended to report that their children started school more prepared in comparison to the reports from principals of rural schools. While the analyses for most Dinaric participants showed no differences in principals' perceptions of the readiness of students for schooling between urban and rural schools, there were differences in home resources for learning. In all participating seven Dinaric systems, students from urban areas had better access to resources such as books in the home and home study supports, and tended to have parents with higher educational and occupational levels.

At the school level, we analyzed the factor school emphasis on academic success and the material resources for learning available in the school. School emphasis on academic success differed between urban and rural schools in only three of the education systems, while in other four there was no difference between urban and rural schools. In Croatia, Montenegro, and Serbia, school emphasis on academic success was lower in rural areas than in urban areas. This led us to investigate school education policies in these systems to discover the reasons underlying such differences. We also examined the material resources that were available to students in schools. In general, in most of the participating systems, urban and rural schools has similar levels of access to technology, libraries, and laboratories. There were a few exceptions to this, which may provide important lessons for improving learning environment in rural schools. For instance, students in urban schools in Albania had greater access to laboratories and to assistance in conducting science experiments than students in rural schools. In Kosovo and North Macedonia, the percentage of rural students that had access to libraries was significantly lower than percentage of students that such critical support in urban area. These findings provide a good basis for policymakers to discuss when considering the topic of rural schools. All Dinaric education systems are advised to devote more attention to equipping rural schools with the requisite technologies and resources to compensate students for the reduction in educational opportunities created by lack of such resources in the home.

Our analyses of the TIMSS 2019 data confirms that an achievement gap between urban and rural areas exists in all seven Dinaric systems. The achievement gap was substantial in Serbia and Kosovo (up to 40 points), both for science and mathematics achievement. Our regression analyses showed that, after controlling for school emphasis on academic success and home resources for learning, the difference in achievement scores between urban and rural schools disappeared. Note that, in our analyses, we simplified the distinction between these two groups of schools (urban and rural), but there may be additional differences between densely populated metropolitan capital cities and other districts.[2]

[2] National achievement testing (Baucal et al., 2007) and analysis of the human development index results (Vujnić, 2014) showed, for example, that treating the center of Belgrade (Serbia) as a separate region returned different perceptives and prediction models for achievement.

Analyses of the TIMSS 2019 results provide valuable evidence-based data for both policymakers and those professionally engaged in topics related to urbanization and education. We have identified several key points that are significant across the Dinaric region: (1) there needs to be increased awareness of the difference in achievement in students from different locations; (2) rural areas often lack resources for learning in the home, putting students from these areas at a disadvantage; and (3) all schools require the requisite technologies and equipment to support their students, while the demands may differ by location. The overarching message is that there are students who experience very different learning conditions created by location, and their achievement may thus differ. We suggest that families from rural areas require significant support in order to minimize the differences in learning outcomes among students. Schools may need additional support to provide the laboratory equipment, materials, computers, and software that can help in better developing students' competencies. Of course, the availability of school resources does not automatically mean that they will be used in the classroom; teachers also need to have the knowledge and skills to use the available resources successfully. Therefore, resources need to be accompanied by investment in the professional development of teachers' competencies so that educational resources are used most effectively. As well as equipping households with computer equipment and supplying books, families will need additional support to make optimal use of the materials. The learning process in rural schools needs to be constantly reviewed, to broaden understanding of the factors affecting student achievement. In future analyses, it would be interesting to compare this Dinaric data with similar research efforts in other European countries, or even a more global TIMSS context.

References

Baucal, A., Pavlović-Babić, D., Plut, D., & Gvozden, U. (2007). *Nacionalno testiranje obrazovnih postignuća učenika III razreda osnovne škole – Izveštaj za Ministarstvo prosvete i sporta* [Grade 3 national assessment: Report for the Ministry of Education and Sport of the Republic of Serbia]. Zavod za vrednovanje kvaliteta obrazovanja i vaspitanja.

Boljka, U., Nagode, M., Rosič, J., Tičar, Ž., Črnak, A., & Kobal Tomc, B. (2018). *Tehnični prenos, ureditev in posodabljanje obstoječe baze podatkov za spremljanje blaginje otrok v Sloveniji* [Technical transfer, arrangement and updating of the existing database for monitoring the well-being of children in Slovenia]. Inštitut Republike Slovenije za socialno varstvo.

Boulifa, K., & Kaaouachi, A. (2015). The relationship between students' perception of being safe in school, principals' perception of school climate and science achievement in TIMSS 2007: A comparison between urban and rural public school. *International Education Studies, 8*(1), 100–112. https://doi.org/10.5539/ies.v8n1p100

Bruner, J. S. (1983). *Child's talk: Learning to use language*. Oxford University Press.

Cole, M., & Wertsch, J. V. (1996). Beyond the individual-social antinomy in discussions of Piaget and Vygotsky. *Human Development, 39*(5), 250–256. https://doi.org/10.1159/000278475

Conceição, P. (2019). *Human development report 2019: Beyond income, beyond averages, beyond today: Inequalities in human development in the 21st century*. United Nations Development Programme. http://hdr.undp.org/sites/default/files/hdr2019.pdf

Darling-Hammond, L. (1996). The right to learn and the advancement of teaching: Research, policy, and practice for democratic education. *Educational Researcher*, *25*(6), 5–17. https://doi.org/10.3102%2F0013189X025006005

Dawes, L. (2008). *The essential speaking and listening: Talk for learning at key stage 2*. Routledge.

Eftimoski, D. (2006). Measuring quality of life in Macedonia-using human development indicators. *Zbornik Radova Ekonomskog Fakulteta u Rijeci: Časopis Za Ekonomsku Teoriju i Praksu, 24*(2), 257–272.

Erberber, E. (2009). *Analyzing Turkey's data from TIMSS 2007 to investigate regional disparities in eighth grade science achievement*. Ph.D. thesis, Lynch School of Education, Boston College, MA, USA. http://hdl.handle.net/2345/727

European Commission. (2014). *Empowering rural stakeholders in the Western Balkans.* Drafted by the PREPARE Partnership for Rural Europe. European Commission. http://www.preparenetwork.org/files/AGRI%20Rapport%20Balkan-Projet-SAB-defmini.pdf

Fernández, M., Wegerif, R., Mercer, N., & Rojas-Drummond, S. (2001). Re-conceptualizing "scaffolding" and the zone of proximal development in the context of symmetrical collaborative learning. *The Journal of Classroom Interaction, 36*(2), 40–54.

Fishbein, B., Foy, P., & Yin, L. (2021). *TIMSS 2019 User guide for the international database.* TIMSS & PIRLS International Study Center, Boston College. https://timssandpirls.bc.edu/timss2019/international-database

Fraillon, J., Ainley, J., Schulz, W., Friedman, T., & Duckworth, D. (2020). *IEA International Computer and Information Literacy Study 2018. Technical report*. International Association for the Evaluation of Educational Achievement. https://www.iea.nl/publications/technical-reports/icils-2018-technical-report

Gajić, A. (2015). Different methodological approaches in defining rural and urban areas. *Arhitektura i Urbanizam, 41*, 63–67.

Goddard, R. D., Sweetland, S. R., & Hoy, W. K. (2000). Academic emphasis of urban elementary schools and student achievement in reading and mathematics: A multilevel analysis. *Educational Administration Quarterly*, *36*(5), 683–702. https://doi.org/10.1177%2F00131610021969164

Goodall, J. (2020). Scaffolding homework for mastery: Engaging parents. *Educational Review*. https://doi.org/10.1080/00131911.2019.1695106

Goss, S. (2012). *Rural household survey: Analysis.* United Nations Development Programme. https://www.ba.undp.org/content/dam/bosnia_and_herzegovina/docs/Research&Publications/NHDR/2013/Annex%205%20-%20Rural%20Household%20Survey%20-%20Analysis%20and%20Data.pdf

Gunawardena, M., Sooriyampola, M., & Walisundara, N. (2017). Scaffolding thinking in ESL lessons: Negotiating challenges. *Thinking Skills and Creativity, 24*, 279–285. https://doi.org/10.1016/j.tsc.2017.04.004

Hanushek, E. A. (1997). Assessing the effects of school resources on student performance: An update. *Educational Evaluation and Policy Analysis*, *19*(2), 141–164. https://doi.org/10.3102%2F01623737019002141

Hedges, L. V., Laine, R. D., & Greenwald, R. (1994). An exchange: Part I: Does money matter? A meta-analysis of studies of the effects of differential school inputs on student outcomes. *Educational Researcher*, *23*(3), 5–14. https://doi.org/10.3102%2F0013189X023003005

Hooper, M., Mullis, I., & Martin, M. (2013). TIMSS 2015 context questionnaire framework. In I. Mullis & M. O. Martin (Ed.), *TIMSS 2015 assessment frameworks* (pp. 61–85). TIMSS & PIRLS International Study Center, Boston College. https://timssandpirls.bc.edu/timss2015/downloads/T15_FW_Chap3.pdf

Hoy, W. K., Tarter, C. J., & Kottkamp, R. B. (1991). *Open schools, healthy schools: Measuring organizational climate*. Corwin Press.

Kelly, D. L., Centurino, Victoria, Martin, M. O., & Mullis, I. V. S. (Eds.). (2020). *TIMSS 2019 encyclopedia: Education policy and curriculum in mathematics and science.* TIMSS & PIRLS

International Study Center, Boston College. https://timssandpirls.bc.edu/timss2019/encyclopedia/

Klonsky, M. (2002). How smaller schools prevent school violence. *Educational Leadership*, *59*(5), 65–69. http://www.ascd.org/publications/educational-leadership/feb02/vol59/num05/How-Smaller-Schools-Prevent-School-Violence.aspx

Kozulin, A. (2003). Psychological tools and mediated learning. In A. Kozulin, B. Gindis, S. V. Ageyev, & S. Miller (Eds.), *Vigotsky's educational theory in cultural context* (pp. 15–38). Cambridge University Press.

Krstevska, M., & Trenceva, N. (2016). Strengthening the rural entrepreneurship in the Republic of Macedonia. *Školabiznisa, 2*, 14–28.

Laffey, J. M., Espinosa, L., Moore, J., & Lodree, A. (2003). Supporting learning and behavior of at-risk young children: Computers in urban education. *Journal of Research on Technology in Education, 35*(4), 423–440. https://doi.org/10.1080/15391523.2003.10782394

Martin, M. O., von Davier, M., & Mullis, I. V. S. (Eds.). (2020). Methods and procedures: TIMSS 2019 *technical report.* TIMSS & PIRLS International Study Center, Boston College. https://timssandpirls.bc.edu/timss2019/methods

Mercer, N. (2000). *Words and minds: How we use language to think together*. Routledge.

Mercer, N., & Littleton, K. (2007). *Dialogue and the development of children's thinking: A sociocultural approach.* Routledge.

Mercer, N., Dawes, L., Wegerif, R., & Sams, C. (2004). Reasoning as a scientist: Ways of helping children to use language to learn science. *British Educational Research Journal, 30*(3), 359–377.

Milanović, M. R., Radojević, V., & Škatarić, G. (2010). Depopulacija kao faktor ruralnog i regionalnog razvoja u Crnoj Gori [Depopulation as a factor of rural and regional development in Montenegro]. *Škola Biznisa, 4*, 32–40.

Miljević-Riđički, R., Pahić, T., & Vizek Vidović, V. (2011). Suradnja roditelja i škole u Hrvatskoj: sličnosti i razlike urbanih i ruralnih sredina [Parents and school cooperation in Croatia: Similarities and differences in urban and rural settings]. *Sociologija i Prostor, 49*(2), 165–184.

Mohammadpour, E., & Abdul Ghafar, M. N. (2014). Mathematics achievement as a function of within-and between-school differences. *Scandinavian Journal of Educational Research, 58*(2), 189–221.

Mullis, I. V., & Martin, M. O. (2017). *TIMSS 2019 assessment frameworks.* TIMSS & PIRLS International Study Center, Boston College. https://timssandpirls.bc.edu/timss2019/frameworks/

Nedić, J., Jošić, S., & Baucal, A. (2015). The role of asymmetrical interaction in the assessment of nonverbal abilities of children from the drop-in center. *Teaching Innovations, 28*(3), 189–206. http://scindeks.ceon.rs/Article.aspx?artid=0352-23341503189N&lang=en

OECD. (2019). *Education at a Glance 2019: OECD indicators.* OECD Publishing. https://doi.org/10.1787/f8d7880d-en

Panselinas, G., & Komis, V. (2009). 'Scaffolding' through talk in groupwork learning. *Thinking Skills and Creativity, 4*(2), 86–103. https://doi.org/10.1016/j.tsc.2009.06.002

Piyaman, P., Hallinger, P., & Viseshsiri, P. (2017). Addressing the achievement gap: Exploring principal leadership and teacher professional learning in urban and rural primary schools in Thailand. *Journal of Educational Administration, 55*(6), 717–734. https://doi.org/10.1108/JEA-12-2016-0142

Radišić, J., & Jošić, S. (2015). Challenges, obstacles and outcomes of applying inquiry method in primary school mathematics: Example of an experienced teacher. *Teaching Innovations*, *28*(3), 99–115. http://scindeks.ceon.rs/Article.aspx?artid=0352-23341503099R

Rajovic, G., & Bulatovic, J. (2015). Some geographical aspects of rural development with view of Montenegro: A review. *Journal of Economic and Social Thought*, *2*(1), 3–15. http://www.kspjournals.org/index.php/JEST/article/view/127

Seberová, A., Göbelová, T., Šimik, O., & Sikorová, Z. (2020). Educational scaffolding in primary education from the perspective of younger-aged school pupils. *Pedagogika*, *70*(4), 553–568. https://ojs.cuni.cz/pedagogika/article/view/1694/1468

Stone, C. A. (1998). The metaphor of scaffolding: Its utility for the field of learning disabilities. *Journal of Learning Disabilities*, *31*(4), 344–364. https://doi.org/10.1177%2F002221949803100404

Somun-Krupalija, L. (2011). *Gender and employment in Bosnia and Herzegovina: A country study*. International Labour Office.

The Agency for Statistics of Bosnia and Herzegovina, the Federal Ministry of Health, the Ministry of Health and Social Welfare of the Republic of Srpska, & the Institute for Public Health of the Federation of Bosnia and Herzegovina. (2013). *Bosnia and Herzegovina Multiple Indicator Cluster Survey (MICS) 2011–2012, Monitoring the situation of women and children. Final report*. UNICEF. https://mics.unicef.org/surveys

TIMSS & PIRLS International Study Center. (2018). *TIMSS 2019 context questionnaires.* TIMSS & PIRLS International Study Center, Boston College. https://timssandpirls.bc.edu/timss2019/questionnaires/index.html

UNDP. (2013). *Rural development in Bosnia and Herzegovina: Myth and reality.* United Nations Development Programme. http://hdr.undp.org/en/content/rural-development-bosnia-and-herzegovina-myth-and-reality

UNICEF. (2020). *Situation analysis of children in Bosnia and Herzegovina.* UNICEF. https://www.unicef.org/bih/en/reports/situation-analysis-children-bosnia-and-herzegovina

United Nations. (1999). *Resolution 1244 (1999). Adopted by the Security Council at its 4011th meeting, on 10 June 1999.* United Nations Security Council. https://digitallibrary.un.org/record/274488?ln=en

Van de Pol, J., Volman, M., & Beishuizen, J. (2010). Scaffolding in teacher–student interaction: A decade of research. *Educational Psychology Review*, *22*(3), 271–296. https://doi.org/10.1007/s10648-010-9127-6

Vujnić, A. (2014). Regional development indicators, case study: Serbia. *Research Review of the Department of Geography, Tourism and Hotel Management*, *43*(1), 28–41.

Vygotsky, L. S. (1934/2012). *Thought and language*. MIT Press.

Wasley, P. A., Fine, M., Gladden, M., Holland, N. E., King, S. P., Mosak, E., & Powell, L. C. (2000). *Small schools: Great strides. A study of new small schools in Chicago.* The Bank Street College of Education.

Webster, B. J., & Fisher, D. L. (2000). Accounting for variation in science and mathematics achievement: A multilevel analysis of Australian data Third International Mathematics and Science Study (TIMSS). *School Effectiveness and School Improvement, 11*(3), 339–360. https://doi.org/10.1076/0924-3453(200009)11:3;1-G;FT339

Wood, D., Bruner, J. S., & Ross, G. (1976). The role of tutoring in problem solving. *Journal of Child Psychology and Psychiatry, 17*, 89–100. https://doi.org/10.1111/j.1469-7610.1976.tb00381.x

World Bank. (2019). *Western Balkans and Croatia urbanization and territorial review.* World Bank. http://hdl.handle.net/10986/32308

Yin, L., & Fishbein, B. (2020). Creating and interpreting the TIMSS 2019 context questionnaire scales. In M. O. Martin, M. von Davier, & I. V. S. Mullis (Eds.), Methods and procedures: TIMSS 2019 *technical report* (pp. 16.1–16.331). TIMSS & PIRLS International Study Center, Boston College. https://timssandpirls.bc.edu/timss2019/methods/chapter-16.html

Smiljana Jošić holds a Ph.D. in Psychology from the University of Belgrade, Serbia. She is employed as a researcher at the Institute for Educational Research in Belgrade and is engaged in several large-scale assessment studies as a data manager (TIMSS 2019, TALIS 2013, LaNa 2019). Her main field of interest is the development of different cognitive processes through social interaction (reading competence, decision-making, intelligence etc.) embedded in educational contexts.

Barbara Japelj Pavešić is a researcher at the Educational Research Institute, involved in international large-scale assessments in education, nationally coordinating IEA's TIMSS, and OECD's TALIS. With a background in mathematics and statistics, her field of research is the statistical

modeling of complex data to explain the knowledge and learning of mathematics and science of students K-13.

Nikoleta Gutvajn works as the director of the Institute for Educational Research in Belgrade, Serbia. Her research interests include identity, school underachievement, and qualitative methodology in educational research. During her employment at the Institute, she has participated in different national and international projects in the field of education.

Mojca Rožman is a research analyst at IEA's Research and Analysis Unit. Her background is in psychology and statistics. She has experience in questionnaire development and scaling of questionnaire data. Her interests are methodology and statistical analysis in international large-scale assessments.