

**QUALITY AND EQUITY OF EDUCATION IN SERBIA:
EDUCATIONAL OPPORTUNITIES OF THE VULNERABLE
PISA ASSESSMENT 2003 and 2006 data**

**Aleksandar BAUCAL
Dragica PAVLOVIĆ-BABIĆ**

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Referees: Slavko Gaber, PhD
Tinde Kovac-Cerovic, PhD
Tanja Rankovic

Editor: Jelena Markovic

*Language editor
and proof-reader:* Tatjana Jovanic

Print preparation: Violeta Djokic

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Institute of Psychology, Faculty of Philosophy, Belgrade

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Analysis of impact of public policies implemented in the period 2003-2007

Every responsible government bases its public policies on detailed analyses and information. International best practices show that the established system and regular public impact analyses contribute to enhanced transparency of Government work, development of more efficient and effective measures and better allocation of available funds and capacities.

Poverty Reduction Strategy Implementation Focal Point launched the Analysis of Impact of Public Policies implemented in the period 2003-2007 in order to establish how efficient had been certain measures implemented in that period. In this way we have sought to identify measures that led to improvement of the life of citizens in Serbia as well as those that are not cost effective and need to be made either more efficient or revoked.

The analyzed measures were identified in cooperation with the colleagues from Governmental and non-governmental agencies.

We analyzed the direct impact of active labor employment measures and their indirect impact on poverty reduction. We also analyzed the links between employment and education of adults i.e. employment and the implemented additional trainings and re-trainings. Since lack of education has been identified as one of the key causes of poverty in Serbia, particular attention in the analysis was paid to educational interventions taken in the period 2003-2007 and their impact on poverty reduction. We analyzed the impact of introduction of mandatory preschool education, examined the relationship between quality of education and poverty as well as impact and efficiency of affirmative measures implemented over the past four years. In the area of health, we analyzed the impact of measures targeting the most vulnerable population with a special focus on Roma. In order to complete the image on the efficiency of State measures on the most vulnerable, we conducted a detailed analysis of impact of cash benefits received by the population in Serbia (MOP and child allowances). The impact of material subsidies that small and medium size enterprises were eligible for was also subject of analysis as was the impact of Government measures for agriculture development promotion.

The obtained results in the process of policy impact analyses were presented to relevant Government institutions and civil society. Future directions were agreed jointly. In this way, we enabled direct influence of results of analyses on defining measures for improvement of lives of the most vulnerable citizens of Serbia in the coming years. The process itself will influence development of capacities of Government institutions for regular analysis of impact of public policies and establishment of a continuous process highlighting commitment to development of democratic and accountable government.

The final versions of the above analyses are available at www.prsp.sr.gov.yu

Poverty Reduction Strategy Implementation Focal Point of the Deputy Prime Minister

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SUMMARY

The Program for International Student Assessment (PISA) was initiated by OECD (Organization for Economic Cooperation and Development) countries with the main purpose to provide systematic monitoring of education quality and equity in some participating countries. OECD countries have recognized that international success, competitiveness and development of a country are increasingly dependent on education quality and equity. It has been identified that it is indispensable to set a permanent system of monitoring of education quality and equity in order to develop policies based on data thereof that will enable permanent promotion of education quality and equity. In many countries, PISA assessment outcomes are subject to serious public and expert debates and on the basis thereof strategic decisions in the area of education policy are adopted. Furthermore, PISA has become one of the instruments at the EU level aimed at monitoring of achievement of the Lisbon goals. Although there are criticisms and open issues, PISA currently represents one of the biggest international programs in the area of education and one of the most important focal points for the education policy.

The PISA assessment systematically monitors the level of functional literacy in the domain of mathematical, scientific and reading literacy achieved by students at age of 15 in participating countries. These three domains are selected as the most general and most relevant indicators of students' education performance. A characteristic of the PISA assessment is that it does not test extend to which students can reproduce what they have learned in schools, but the extent to which the students are competent to understand and use the information (provided to them) when solving some relevant everyday-life problems. In this way the PISA assessment aims to determine to what extent new generations are prepared to live in a modern society, and not to what extent they have mastered curricula they have been learning at school. Furthermore, goals of the PISA assessment are to determine to what extent various contextual factors (characteristics of education system, family environment, school and students) impact on the students' achievement.

Based on a Decision adopted by the Ministry of Education and Sports, Serbia is participating in the PISA assessment since 2001. So far, students from Serbia have taken part in two surveys (2003 and 2006), and in December 2010 outcomes of 2009 survey will be made available. During the previous period, publishing of the PISA outcomes in Serbia was followed by various discussions regarding the relevance of the PISA assessment for designing of the national education policy. This report is based on a supposition that the PISA assessment is relevant for further education system development primarily due to the fact that next generations in Serbia will be citizens of the European Union. Children who enrolled in first grade of elementary schools in 2008 will complete their secondary education in 2020 and will retire in 2060. Namely, future generations will spend most of their lives within the EU and therefore it has become important for the society and for the state to assess the extent of which the Serbian education system prepares children and the young for their future.

The main objective of this report is to formulate recommendations based on the PISA 2003 and 2006 data assessment aimed at setting of education quality and equity in Serbia. The objective of the PISA data analysis is to determine the following: (a) *quality and equity of the education in Serbia*, i.e. to what extent the Serbian education system "prepares" the youth in Serbia for their life in the EU in an adequate manner and whether the current education quality is accessible to all young people in an equal manner; and (b) *to what extent is the Serbian education system efficient (cost-benefit assessment)*, i.e. whether the education performance of the students correspond to resources available to the Serbian education system, i.e. to circumstances within which it operates. Three indicators were used to describe circumstances within which the Serbian education system functions: investments into the education, teachers' salaries and student-to-teacher ratio.

All presented analysis are comparable, data for Serbia have been compared with data for Croatia, Slovenia, Bulgaria, Romania, Slovakia, Poland, Norway and Finland. These countries are selected as countries that for various reasons can be compared with data obtained for Serbia. Croatia and Slovenia are selected as former Yugoslav republics with which Serbia shares the education tradition to the great extent and that are important Serbian competitors in the region. Bulgaria and Romania are selected as former socialist countries, now EU members, neighboring countries, and moreover, Serbian competitors in the region. Slovakia and Poland are selected as former socialist countries, EU members, and according to the results achieved they are closed to the OECD average. Besides, Slovakia and Poland can be considered as „successful examples“ when talking about the education reform in former socialist countries – it is fair to say that Slovakia has a very efficient education system, because it is achieving results that are almost at the level of the OECD average with relatively low investments, while Poland has succeeded in achieving continuous improvements in the past PISA surveys, especially in domain of reading literacy. Finally, Finland and Norway are selected as examples of the „Scandinavian“ education model that is internationally considered very successful – Finland is a „PISA Champion“

in all past surveys, while Norway is a country that is investing significant funds into the education and has one of the most inclusive education systems in the world.

When drafting the recommendations, besides these comparative assessments, additional two kinds of information have been taken into account: (a) in which way are PISA assessment results used in other countries aimed at designing education policy measures i.e. aimed at improving the education quality and equity; and (b) which are the features characterizing education systems with high level of quality and equity.

The next section of the summary will firstly present main findings based on the PISA assessment results followed by summary of main recommendations. More details regarding both findings and recommendations will be presented in the main sections of the report.

Education performance of students in Serbia. Assessment of the education performance by students at age of 15 in Serbia indicates that the average performance in three surveyed domains (mathematical, scientific and reading literacy) is by around 60-70 score points below the OECD average, but by around 30-90 score points lower compared to the education performance of students in Croatia and Slovenia (mostly in the domain of the reading literacy). Taking into account that impact of a year of education amounts to around 38 score points, it implies that the students in Serbia would require from one to almost three years of additional education in order to catch up with students from Croatia, Slovenia and other OECD countries. Namely, the impact achieved in 9 years of education in other countries, would require in Serbia 10-12 years indicating lower level of quality and efficiency of the Serbian education system.

The lowest performance of the Serbian students is in the domain of the reading literacy, whereby the level of reading literacy in 2006 was significantly lower compare to the 2003 results. Furthermore, what does arouse concerns is the fact that about 40-50% of the students in Serbia may be considered functionally illiterate from the standpoint of criteria applied in the EU countries (i.e. those that do not achieve the second level of performance on the PISA scale).

A group of about 60-75% most vulnerable students is characterized by the functional illiteracy therefore they are left with almost no hope to be able to break the so-called „vicious circle of poverty“, representing a challenge to the state: how to provide to these children a „second chance“ later on in circumstances of underdeveloped lifelong education system.

Education Quality in Serbia. As regards the education quality, it is slightly better in the domain of mathematical and scientific literacy than in the domain of reading literacy (by almost one year of education), but in all domains it was lower in 2006 compared to 2003 (the most in the domain of the reading literacy in which domain the students from Serbia were already achieving vary poor results).

The education quality in Serbia is at the level or slightly above the level achieved in Bulgaria and Romania, and significantly lower compared to the quality in former Yugoslav republics of Croatia and Slovenia.

All these data indicate that the education system in Serbia prepares the young generation for their life in the EU insufficiently. Furthermore, the fact that the education quality was slightly better in 2003 than in 2006 indicate that measures and policies implemented after 2003 have not given positive effects, but on the contrary they have caused decline of the education quality.

Education Equity in Serbia. All afore-stated findings lead to a general conclusion that the current level of the education equity in Serbia, compared to other countries, is relatively acceptable.

However, there are secondary impacts of the poverty that need to be taken into consideration i.e. very successful students from the poorest layers have less opportunities to enroll into general-profile academic secondary education after graduating from primary school that could enable them to continue education and reach an education level in line with their potentials.

Although the education equity in Serbia can be evaluated as relatively acceptable, this should not „mask“ a fact that the education level among the most vulnerable students is extremely low, although they spend no less than nine years in the education system.

Cost-benefit Assessment (efficiency assessment) indicates that the overall investment in education in Serbia is below the EU average (3.5-4.5% vs. 5% GDP), that the average annual teacher salary amounts to about 90% of GDP per capita which is in line with the salary levels in other countries included as benchmarks in this report, and student-to-teacher ratio in the elementary education is at the level of the EU countries.

Moreover, the cost-benefit assessment indicates that the Serbian education system could be more successful even under the current circumstances. The fact that the Serbian education system performs below its potentials is interpreted as an indication that the overall system is unmotivated and therefore not rendering as it could. This absence of motivation is partly caused by the overall situation in past 20 years, but it can be also caused by the fact that the education has not been given a priority on the political agenda and the education is

discussed only when extremely negative and dramatic events happen in schools; furthermore directions of the education development are completely unclear (lack of goals and challenges), and the comprehensive education reform launched in 2001 was interrupted with no clear reasons and no clear alternative, etc. In such circumstances, one of action priorities should be to „mobilize“ the system and harmonize directions of the Serbian education system development.

Obtained findings imply that there is a need to increase investment in education, but additional investments should not finance higher teachers' salaries, but raising motivation and improving the current education quality and equity in Serbia. Increased investments in education should be followed by development of good mechanisms to ensure control over spending as well as more efficient and more transparent spending. Without these mechanisms, additional investment will not generate improvement of the education quality and equity.

Education Policy of Other Countries is Focused on Improving Students' Performance. This section main objective is to determine characteristics common to education systems that have the best average PISA performance. Generally speaking, all successful education systems are similar in terms of their streaming not only to ensure education quality improvement, but also to ensure equal education opportunity to all students. The objective is full coverage of all children by the general education and inclusion of all categories of children with special needs. Moreover, successful education systems have clearly defined relations between all stakeholders involved in the education process, i.e. from teacher education institutions, local communities to the labor market. Education is a coherent system with clearly defined education goals and methods of monitoring of levels of achievement of goals. Furthermore, experiences of the other countries suggest that there is a range of activities emerged as an answer to the PISA assessment results, clearly demonstrating how PISA can be used in setting education policy. Experiences presented in this section *are not recommendations*. The idea is to present a set of various solutions and their applicability in circumstances of the Serbian education system would require some additional analysis.

Improving the Education Performance Quality in Serbia: Recommendations. Short-term and long-terms recommendations are formulated.

Short-term recommendations relate to what should be done in terms of the PISA 2009 survey. On the one hand, it has been recommended that the Ministry of Education promote the PISA 2009 survey, to send a clear message regarding importance of our participation in this international program and to mobilize the schools, teachers and students to take part in the PISA 2009 survey and to achieve the best possible performances. Within the PISA survey promotion, a particular focus should be given to providing information the general public and particularly the practitioner community about methods of testing and opportunities to develop the functional literacy systematically. The Ministry of Education should public and disseminate PISA test compilations to enable students and teachers in Serbia to understand what does the functional literacy mean and how can it be tested. On the other hand, since the PISA 2009 survey results will be published by the end of 2010, it has been proposed that the Ministry, together with other important institutions (for example, National Education Council, Institute for Education Improvement and Institute for Evaluation of Education Quality) should implement a set of preparatory activities aimed at ensuring that the public and professional discussions regarding the PISA 2009 survey findings be the most constructive ones and to contribute to development of education policy and measures that will lead to improvement of the Serbian education quality and equity.

Besides these short-term recommendations, following long-term measures have been formulated, as well aimed at ensuring permanent and sustainable development of the Serbian education system quality and equity. The next section provides summery of some of the key long-term recommendations.

- *Increasing investment in education*, to approach the EU average enabling in this way the education system to function in better conditions, but also to recognize education as a valuable investment.
- *Drafting and adopting of the National Education Development Strategy*. The national strategy would ensure the directions of the education development in Serbia be public and adopted by consensus of all relevant stakeholders which would ensure long-term sustainability, irrespective of the political changes and political situation.
- *Developing indicators for permanent systematic monitoring of the education system*. The indicators would enable empiric checks whether strategic measures are being implemented and whether implemented of the expected scope.

- *Developing education performance standards for the compulsory education*, aimed at supporting the integration of contents and acquiring knowledge relevant to the education continuation and everyday life, but standards that are harmonized with competencies promoted in the EU.
- *Harmonization of curricula, textbooks and other teaching aids with education performance standards.*
- *Improving national system of monitoring and evaluation of the education performance.* The current system was rudimentally developed and improvement of the education performance requires an external system of testing of performances that includes national testing at the end of some educational cycles as well as realization of national and international surveys that besides for monitoring are used for collection of data regarding connection between various aspects of the education system and characteristics of well-performing students.
- *Standardization and improvement of the school grading system* - currently the grading system is regulated by rulebooks with general grading criteria. Due to formative causation that grades have on students as well as due to the importance for the education continuation, it is necessary that grading criteria be harmonized and public.
- *Monitoring and evaluation of positive experiences of other education systems*, to the extend to which they fit into our education system and able to be harmonized with the Serbian education policy.

* * *

The Table below summarizes education performance of the students, education quality and equity in Serbia in 2003 and 2006 according to the stated parameters.

Mathematical literacy					
	Serbia 2003	OECD 2003	Serbia 2006	OECD 2006	Serbia 2006 vs. 2003
Education performance	437	500	435	498	=
Education quality	445	500	440	500	▼
% of functional illiteracy	42%	21%	43%	21%	=
Equity (SES impact)	36	42	35	38	=
Gender difference (M vs. F)	1 (nr)	11	5 (nr)	11	=

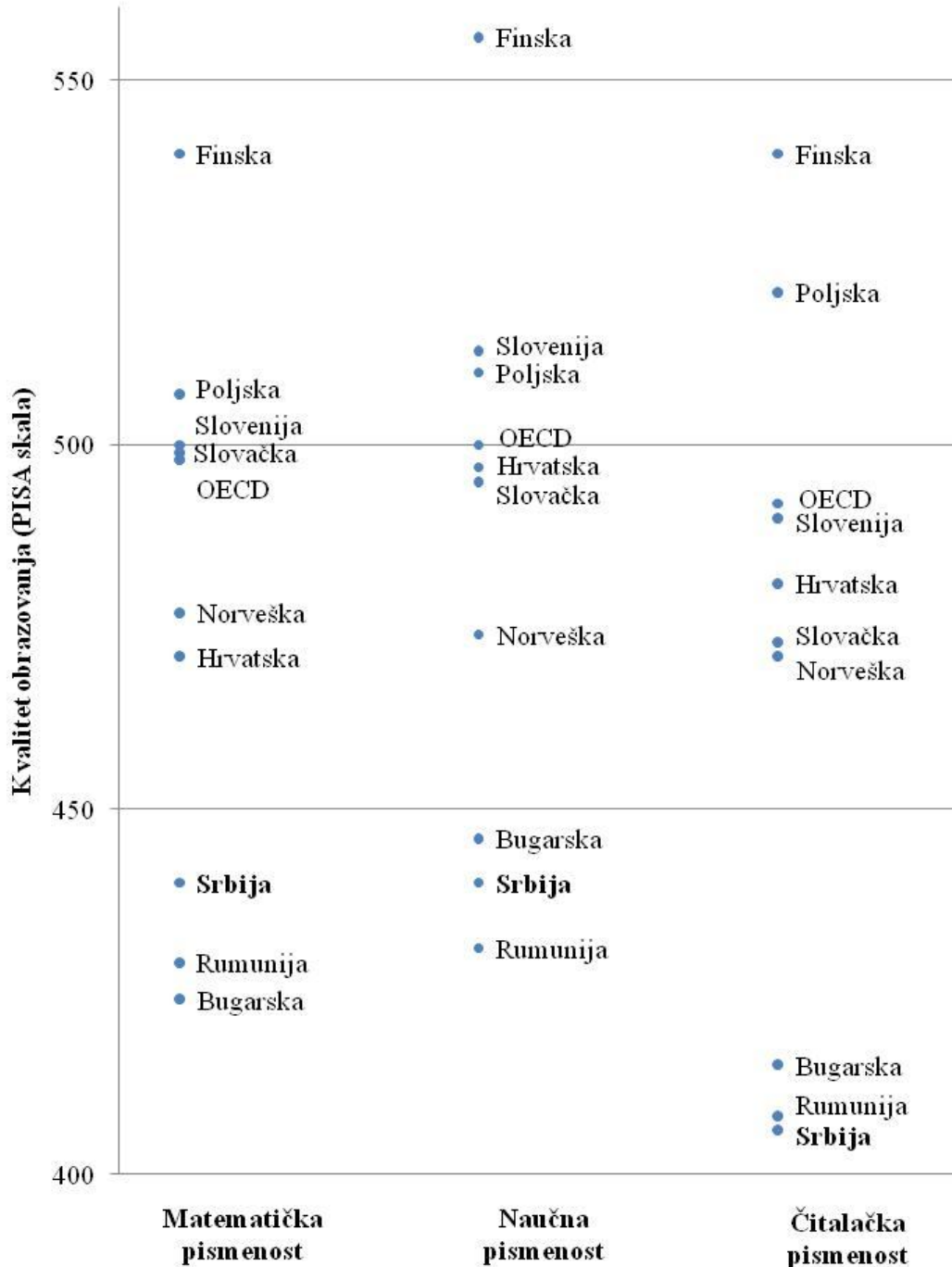
Reading literacy					
	Serbia 2003	OECD 2003	Serbia 2006	OECD 2006	Serbia 2006 vs. 2003
Education performance	412	494	401	492	▼
Education quality	420	500	406	500	▼
% of functional illiteracy	47%	19%	52%	20%	▼
Equity (SES impact)	34	41	36	38	=
Gender difference (M vs. F)	-43	-34	-42	-38	=

Scientific literacy					
	Serbia 2003	OECD 2003	Serbia 2006	OECD 2006	Serbia 2006 vs. 2003
Education performance	436	500	436	500	=
Education quality	445	500	440	500	▼
% of functional illiteracy	-	-	38%	19%	=
Equity (SES impact)	35	45	33	40	=
Gender difference (M vs. F)	-5 (nr)	6 (nr)	-5 (nr)	2 (nr)	=

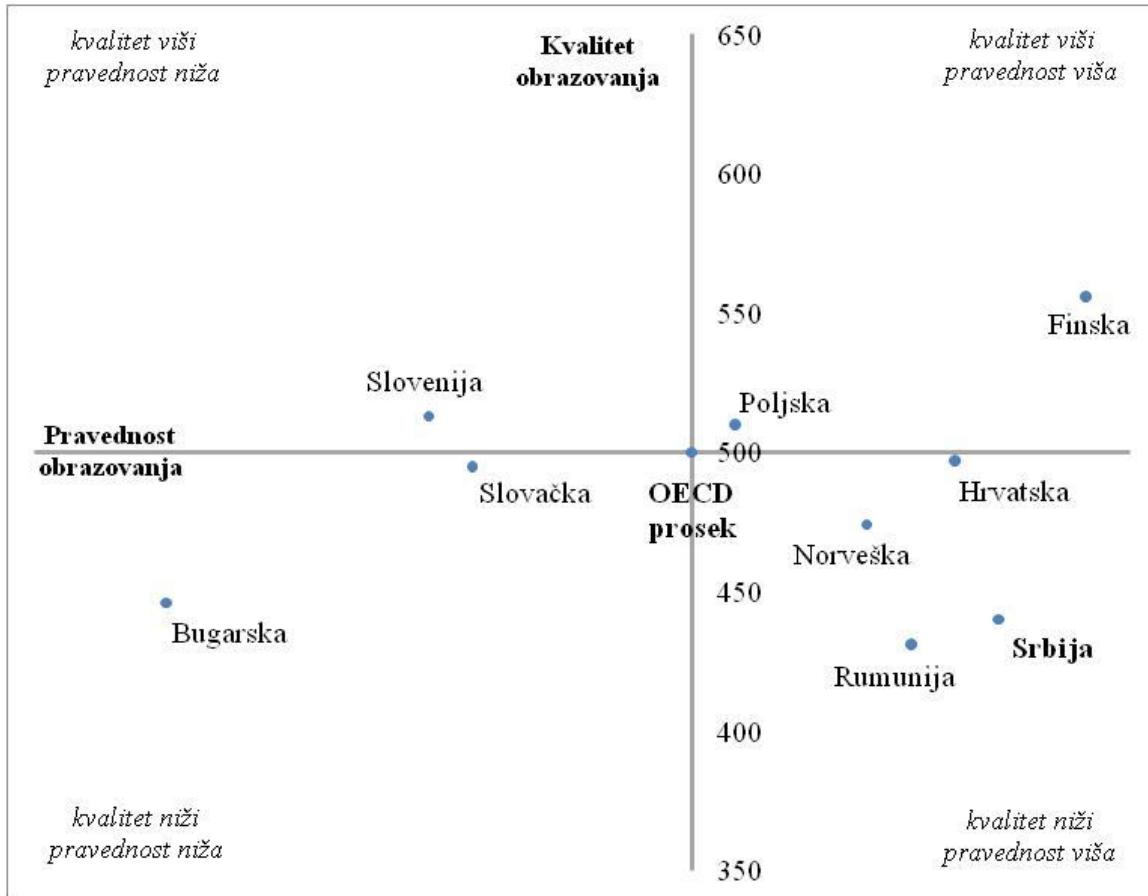
Note: „nr“ indicates that the stated difference in average performance of boys and girls is not statistically relevant (i.e. statistically there is no difference); „▼“ indicates that the situation in Serbian in 2006 deteriorated compared to 2003.

The Figure below shows data regarding the education quality in three PISA domains (mathematical, scientific and reading literacy) in Serbia and other referent countries based on 2006 PISA assessment. The education quality refers to the extent to which the education system is supporting development of the mathematical, scientific and reading literacy in a country and average performance is 500 score points, and the standard deviation is 100 score points. It is estimated that in a year time OECD countries manage to improve the student performance by around 38 score points on average. The education quality in Serbia is the most similar to Bulgaria and Romania, lower compared to Slovenia, Croatia, Poland, Slovakia as well as to the average education quality in OECD countries.

Education Quality (PISA scale)



The Figure below indicates data regarding the education quality and equity in the domain of scientific literacy (PISA 2006) in Serbia and other referent countries. The education quality refers to the extent to which the education system is supporting development of scientific literacy average performance is 500 score points, and the standard deviation is 100 score points. The equity relates to expected difference in education performance for students of various social and economic and cultural status. The average expected difference for the OECD countries is 40 score points (one unit on the PISA SES scale) – countries where it is expected to have smaller difference are those countries where the equity is slightly higher compare to the OECD level, and countries where the expected difference is above 40 score points are those countries where the equity is slightly below the OECD average. Serbia belongs to a group of countries where the education quality is below the OECD level, but the education equity is slightly above the OECD average.



INTRODUCTION

The PISA program - Program for International Student Assessment - was initiated by the Organization for Economic Cooperation and Development (OECD) with the main purpose to provide systematic monitoring of the quality and equity of the education in participating countries. OECD countries have recognized that the success, competitiveness and development of a country is increasingly depending on the education quality and equity. Therefore, the most developed countries have proclaimed the 21st century „the century of knowledge“. Besides, great number of countries is investing significant funds into education of not only children and the young, but they are increasingly investing into the life-long education (i.e. new forms of adult education).

This is the reason causing establishment of a system of permanent monitoring of the education quality and equity aimed at obtaining reliable and valid data on human resource quality within a society. The main purpose is to use data basis for development of „informed“ education policies and measures that will ensure continuous improvement of the education quality and equity. In many countries, PISA assessment outcomes are subject to serious public and expert debates and on the basis thereof strategic decisions in the area of education policy are adopted. Furthermore, PISA has become one of the instruments at the EU level aimed at monitoring of achievement of the Lisbon goals. Although there are critics and open issues, PISA currently represents one of the biggest international programs in the area of education and one of the most important focal points for the education policy.

Serbia has started to take part in the PISA assessment in 2003 based on a Decision of the Ministry of Education and Sports adopted in 2001. So far, students from Serbia took part in two surveys (2003 and 2006) and next surveys will be in 2009 and in 2012. During the previous period, publishing of the PISA outcomes in Serbia was followed by various discussions regarding the relevance of the PISA assessment for designing of the national education policy. Due to disappointing results, these discussions were usually emotive and insufficiently constructive – they were mainly boiled down to searching for one to blame or disqualification of the PISA assessment. This report is based on a supposition that the PISA assessment is relevant for further education system development primarily due to the fact that next generations in Serbia will be citizens of the European Union. Children who enrolled in first grade of the elementary schools will complete their secondary education in 2020 and will retire in 2060. Namely, future generations will spend most of their lives within the EU and therefore it has become important for the society and for the state to assess to what extent the Serbian education system prepares children and the young for their future. Moreover, we believe that the main point of the PISA results assessment is to formulate and apply in Serbia those quality and equity improvement actions that are applicable within the existing circumstances. This constructive relation toward data that this study offers enables to increase efficiency of the Serbian education system in a long-term and planned manner.

Why is PISA Relevant for the Serbian Education System?

By participating in the PISA assessment, we primarily obtain a whole wealth of research findings providing a complex picture of our education system as well as an opportunity to make grounded decisions related to the education system development and strengthening performances at the national level, but may also relate to some segments of the education process or specific groups participating in the education. A possibility to compare data with all participating countries provides additional information.

In the broadest outline, it should be taken into consideration that generations that are getting an education now in Serbia already belong to the European (education) environment because they will spend the most of their adulthood as EU citizens, so it is an obligation of the education system to ensure performances that are competitive not only within the national but within broader environment.

Box 1.

Main Data on the OECD PISA Program (Program for International Student Assessment)

PISA - The Program for International Student Assessment is currently the biggest international assessment in the area of education. It is implemented by the OECD since 1997. The testing of students is organized every third year (2000, 2003, 2006, 2009...), with the main objective to enable the participating countries to make strategic decisions in the area of education based on empiric data on performances of students and circumstances within which they are educated.

Tests are used to assess knowledge and skills acquired by the students during their education. It is common for PISA to use terms such as literacy or competencies instead of knowledge: term literacy is used to indicate that it is about those skills that are considered the education capital necessary to students to continue education and to be able to cope with personal and professional roles that they will have as adults; and within this study being competent does not mean that somebody has acquired certain knowledge, but that he/she knows how to apply it. In other words, the stress is placed upon functional knowledge and skills, while all problems in tests are related to actual situations in which students can be. The literacy is tested in three domains: mathematical literacy, reading literacy and scientific literacy. Data on average performance (arithmetic mean) of students in each of the tested field are reported for each participating country. Scales are standardized so the average performance is 500 score points, and the standard deviation is 100 score points. Practically it means that two-thirds of the students score between 400 and 600 score points. On the basis of difficulty levels of problems (complexity of skills being tested), a development scale of performance is developed for each domain split into levels of functional literacy. Each level of functional literacy is described through knowledge and skills that a student has acquired.

Besides knowledge test, there are questionnaires for students and schools used to collect data on various factors that can be relevant for performance, for example, material and education resources of a family, attitude of a student toward learning, learning motivation, learning related strategies and habits; computer literacy level and contribution of the school to the informatics literacy; various aspects regarding to how school operates such as: characteristics of teachers (education level, professional motivation, methods of work), class size, composition (homogeneity or heterogeneity), air conditioning in classes and in schools, behavior of teachers toward students, sense of school belonging, school anxiety; financial resources of the schools, financing sources (state or private), management process and decision making, involvement of parents in processes and decision making in schools, etc.

The research covers the students attending formal education at age of 15 (in our case, those are mainly students of the first grade of the secondary school). Number of participating countries, hence number of students covered by the assessment is growing in each cycle. In the first PISA cycle there were 43 countries participating, mainly OECD members, while in the last one i.e. 2006 assessment there were about 400,000 students, representing about 20 million 15-year old students from 57 countries. As regards the PISA 2009 tests, there will be 62 countries and among them there will be students from almost all former Yugoslav republics. Serbia took part at 2003 and 2006 assessment and those results are analyzed in this report.

Moreover, PISA is trying to determine relation between education and national economies; it tests and promotes knowledge and skills necessary from the point of view of coping at the labor market and of career management. Establishing a direct link between the market demand (economy) and education will also be a part of our education system in the near future. PISA represents a good model demonstrating how this link should be established at level of expected education performances.

In many countries at the EU level, data provided by PISA have become indicators to evaluate and monitor progress made in efficiency, equity and quality of education. For example, PISA is one of indicators through which the Commission of the European Communities monitors achievement of Lisbon goals at the level of the European Union by 2010. PISA is also used as an EU indicator of social inclusion, computer literacy and a poverty indicator (Laeken). Great number of countries use PISA results as one of indicators of the education development even in own strategic documents; inter alia, they plan progress in performance based on data from the PISA assessment (for example, all OECD countries, Japan, Croatia, Hong Kong...). In Serbia, PISA results as well as results from national testing of education performances, are used as indicators in implementation of the Poverty Reduction Strategy.

Main Goal and Report Structure

The main objective of this report is to formulate recommendations based on the PISA 2003 and 2006 data assessment aimed at setting of education quality and equity in Serbia. The objective of the PISA data analysis is to determine the following: (a) *quality and equity of the education in Serbia*, i.e. to what extent the Serbian education system "prepares" the youth in Serbia for their life in the EU in an adequate manner and whether the current education quality is accessible to all young people in an equal manner, and (b) *to what extent is the Serbian education system efficient (cost-benefit assessment)*, i.e. whether the education performance of the students corresponds to resources available to the Serbian education system, i.e. to circumstances within which it operates. Three indicators were used to describe circumstances within which the Serbian education system functions: investments into the education, teachers' salaries and student-to-teacher ratio.

The report consists of five chapters. The first chapter contains review of use of PISA results in various countries aimed at education policy development and at launching and designing core education reforms. Within this chapter special attention is given to use of PISA results in three countries: Germany, Finland and Poland. Germany is selected because it represents an example of a country where after an initial shock due to results lower than expected, an extensive education system reform was launched changing even some of the aspects previously believed to be impossible to be changed (for example, division of roles between the federal and republic level, whereas the Federal Government is in charge of setting standards for the student education performance). Finland is selected to show that even countries that used to be very successful in past PISA surveys, continue to work aimed at improving the education quality and equity. In these countries it is often stressed that maintaining of the current quality level is not their objective because in the world where everybody is trying to improve its education system, stagnation would practically mean regression. Finland is a particularly interesting case because education experts from this country are often warning that the Finish model cannot be copied because success of its model is the fact that it pretty relay on certain social and cultural patterns. Finally, Poland is selected as the country that has made the greatest improvement out of the all former socialist countries, especially in the domain of reading literacy in which many countries are experiencing continuous performance decline. All these examples indicate how seriously the PISA assessment results are taken into consideration by other countries mainly aimed at permanent improvement of the education quality and equity.

The second Chapter presents analysis of the education performance of Serbian students at age of 15 in two PISA assessments (2003 and 2006). The analysis has provided answers to three questions: (a) what education performance of the Serbian students i.e. which level of the functional literacy is achieved by the Serbian students after 9 years of education; (b) what is the education quality in Serbia i.e. to what extent the education system in Serbia contributes to students functional literacy; and (c) what is the education equity in Serbia i.e. to what extent the education system enables all students developing the functional literacy. When analyzing PISA results, a special attention has been given to the education performance of the vulnerable students and the education quality available to them. All presented analysis are comparable, data for Serbia have been compared with data for Croatia, Slovenia, Bulgaria, Romania, Slovakia, Poland, Norway and Finland. These countries are selected as countries that for various reasons can be compared with data obtained for Serbia. Croatia and Slovenia are selected as former Yugoslav republics with which Serbia shares the education tradition to the great extent and that are important Serbian competitors in the region. Bulgaria and Romania are selected as former socialist countries, now EU members, neighboring countries, and moreover, Serbian competitors in the region. Slovakia and Poland were selected as former socialist countries, EU members, and according to the results achieved they are closed to the OECD average. Besides, Slovakia and Poland can be considered as „successful examples“ when talking about the education reform in former socialist countries – it is fair to say that Slovakia has a very efficient education system, because it is achieving results that are almost at the level of the OECD average with relatively low investments, while Poland has succeeded in achieving continuous improvements in the past PISA surveys, especially in domain of reading literacy. Finally, Finland and Norway are selected as examples of the „Scandinavian“ education model that is internationally considered very successful – Finland is a „PISA Champion“ in all past surveys, while Norway is a country that is investing significant funds into the education and has one of the most inclusive education systems in the world.

The third Chapter shows the cost-benefit assessment i.e. Serbian education system efficiency assessment. The main question to be answered to by the assessment presented in this chapter is to what extent the PISA 2006 results of the students in Serbia are reflecting conditions in which the Serbian education system operates. In order to answer to this question, three indicators are selected to describe conditions within which the Serbian education system operated in 2005 (a year prior to the PISA 2006 testing): (a) total investments into the

Serbian education system i.e. percentage of GDP allocated in 2005 for education; (b) level of teachers salary expressed as ratio between average annual salary of teachers in Serbia vs. GDP per capita (in 2005), i.e. share of GDP per capita that teachers manage to earn; and (c) student-to-teacher ratio indicating average number of students with which a teacher work. Therefore, PISA 2006 results for Serbia and other countries (included in this report as benchmarks) are linked to the afore-said parameters enabling to estimate to what extent results achieved by the Serbian students can be explained by conditions within which the education system functions i.e. whether results of the students in Serbia are higher or lower compared to those that could be expected based on conditions within which the Serbian education system operates.

The fourth Chapter shows characteristics of successful education systems based on the PISA results. Namely, those are countries with high levels of both education quality and equity (such as Finland). This country is showing that it is possible to have an education system that is at the same time characterized by the high quality level (contributing significantly to development of the functional literacy of the students) and high equity level (ensuring equal opportunities to all students to develop high level of functional literacy). Previous comparative analysis of the education systems indicate that despite numerous differences, successful education systems have a set of common characteristics. These characteristics have been taken into consideration when formulating recommendations presented in the last fifth chapter.

The last, fifth Chapter formulates short-term and long-term recommendations that can contribute to ensure a permanent process of improvement of the Serbian education system quality and equity. Short-term recommendations refer to what could and should be done within Serbian preparation for PISA 2009 testing, while long-term recommendations are focused on sustainable improvement of the Serbian education system quality and equity.

Finally, we would like to express out gratitude to the Deputy Prime Minister's Poverty Reduction Strategy Implementation Focal Point that provided support and numerous comments and suggestions in various stages of our work on this report. We would like to thank also Katarina Randjic from the Ministry of Education of the Republic of Serbia and Sunčica Stefanović-Šestić who provided various data necessary for planning of analysis. A special thanks goes to Slavko Gaber who has always been a very useful interlocutor and partner during the work on this report.

OPPORTUNITIES FOR USING PISA RESULTS FOR EDUCATION DEVELOPMENT: EXPERIENCES AND EFFECTS IN VARIOUS COUNTRIES

One of the expected and planned effects of implementation of PISA findings, as well as other international comparative studies in the area of education, is creation of conditions and needs for cooperation among participants, financiers, managers and politicians that are trying to achieve several objectives, among which the most general one is to improve the education quality and to create more equitable and successful education system. An advantage of an international project compared to the national ones is exactly in extensive opportunities of comparison of various solutions, activities and results in various education systems. PISA is designed to inform stakeholders of the education polity and all parties involved in the education on education performance of the students in the elementary and secondary education in the domain of reading literacy, mathematical literacy and scientific literacy. Findings of the survey represent an important tool aimed at understanding the structure of these key competencies, patterns of their distribution and relation with the environment in which the students live. Therefore, the goal of the PISA study is to provide to participating countries some useful findings regarding where and how their education system and teaching process, especially learning, should be improved or how to maintain the achieved quality level.

By providing this broader context within which to interpret national performances, international comparative aspect of the PISA study can expand and enrich a national picture, but also it provides useful information to the countries regarding areas in which they are relatively strong or relatively weak. The experts implementing international research programs in the area of education confirm that without the international comparison, the education programs are running risks that schools as well as the overall societies may end up only with „perceptions“, convictions and opinions regarding the education quality.

During the last decade in countries participating in the program, the PISA assessment results have caused numerous reactions of the experts in the field of education and of those who are creating education policy. Some mass media have additionally speeded up reactions and reconsiderations. Three countries are selected for this review that are different from each other in terms of their social and economic characteristics and tradition in the area of education, but with a common factor being that the concept of the PISA assessment and achieved results inspired and initiated very vivid education policy activities. We have opted to present some of the reactions to the results of the PISA assessment in Germany, Poland and Finland. In all three PISA cycles these three countries obtained results above the OECD average, while Finland is having extraordinary attainment every time, but however there is a need to use these results in order to make more dynamic development in education. However, these three countries received the PISA reports on performances in different atmospheres. Although we are talking about performance close to the average with the tendency of mild growth, the German general public was every time disappointed by performances, while the line ministry initiated a comprehensive data analysis and reform of the education system based thereby. On the other hand, in Poland education policy measures, specifically inspired by the PISA results, were integrated into a comprehensive education reform that was a part of transition in all areas of the social life in this country within its transition from the socialism to the capitalist society organization. Finally, Finnish experiences are relevant considering that Finland has become a model country in this respect. Although it is very successful in all domains and all so-far implemented assessments, Finland used the PISA results to design and implement measures regarding certain education aspects, being of the opinion that the education is an active process always facing challenges and trying to make progress and improvements.

Reaction to PISA Results in Germany

According to the PISA 2003 report, average performance of the German students on the mathematical literacy scale was 507 score points (OECD average was 499 score points), on the science scale it was 502 score points (OECD average was 500) and on the reading literacy scale it was 491 score points (OECD average was 494).

Likewise in the previous assessment in 2000, German public and experts in the area of education were disappointed with these results. The PISA assessment has, inter alia, shown that almost 20% of the German students at the end of the compulsory education, managed to master only basic grammar and arithmetic, and that they are not able to understand not even the easiest texts. Results indicated also high disparity in the education performance between the students belonging to different social and economic backgrounds.

Although the German government reacted to the 2000 report by increasing the state investment into the education system and requested far-reaching reforms in the traditional national school structure (for example, increasing number of schools with after school care program), once again it was criticized in terms of some issues, among which the most important are the following:

- *Government allocation for the education:* Germany spent 4.6% of the GDP in 2005 (EU average - 5.03%) and 9.8% of the total consumption (EU average - 11.9%).
- *Number of hours spent in the schoolroom:* 806 compared to 885, being the EU average.
- *Student-to-teacher-ratios:* in 2005 this ratio used to be 18.8 in the elementary education (EU average - 14.9), and 15.1 in the secondary education (EU average - 13.1).

Second question that attracted a lot of attention was the German model of school by levels. While the elementary education usually lasts four years (and state schools are not stratified), the secondary education covers four types of schools enrolled by the students upon passing the ability tests. PISA showed that the traditional division to secondary schools preparing the students for the university, general secondary schools and vocational schools is only partly responsible for poor results in Germany. Experiences of other countries indicate that compulsory education prepares children better to obtain general education standards compared to systems that „separate“ children in the early age according to their abilities.

With some partial education reforms underway in many schools throughout Germany since the reunification of the country (equipping schools with computers and access to internet, shorter duration of the *Gymnasium* and introduction of the after school care program), as of 2003 the following measures are implemented or discussion regarding their implementation is conducted:

- *Setting teaching quality standards at the national level:* key elements of the outcome control are education standards connecting all regions and education process evaluation. The Institute for Education Progress (*Institut zur Qualitätsentwicklung im Bildungswesen*– IQB) has developed education standards supported by all regions.
- *More practical work in training provided to teachers:* since 2005 standards for teachers' training adopted in 2004 represent the basis in the education and practical training for teachers as well as for their permanent professional improvement. In June 2005 a reform of the training for teachers was adopted containing guidelines for defining mutual recognition of teachers' diploma.
- *Shifting of responsibility from the federal ministry of education to schools:* in the Federal Republic of Germany responsibility of education is split between the Federation and regions. The Council of Regions (Bundesrat) has right to pass laws unless it transfers this right to the Federation (Bundestag). Within the education system, this refers to the primary and secondary education sector, higher education sector, adult education and continuous education. As regards education, there is no explicit and comprehensive jurisdiction attributed to the federation. Therefore the legislation in the area of culture and education is primarily under jurisdictions of regions.

Besides these measures, German Federal Ministry of Education and Research has initiated a program „Promotion skills – professional qualification for socially vulnerable and target groups with special learning problems“, co-financed by the European Social Fund (ESF). The objective of the program is to provide new opportunities to obtaining qualifications for young adults who have not completed professional training.

Reactions to PISA Results in Poland

Poland has been taking part in the PISA program since the very beginning. Poland is characterized by continuous improvement of performance in reading literacy: in 2000 average performance was 479 score points, in 2003 it was 497 (slightly above the OECD average of 494 score points), and in 2006 - 508 score points (the OECD average - 492). In the same year, the average performance in mathematical literacy was 495 score points (slightly below the OECD average of 498 score points), and 498 score points in scientific literacy (OECD average - 500 score points). In spite of relatively high results obtained and improvement of the average performance in each cycle, some issues have become visible, such as the fact that the students in Poland did not solve problems requiring independent analytical and creative thinking sufficiently well (14,7 score point below the OECD level).

Polish Government has presented reactions to the PISA assessment results in the *National Development Plan* for the period 2007 - 2013. Key elements of implementation of the Development Plan is an operational program called *Education and Qualification*. The initial draft of September 12, 2005 stresses three areas of priority activities:

1. *Preventing social exclusion through the education*: education is understood as a main instrument for the social cohesion and integration. In that respect, it is planned to implement the following activities in kindergartens: pre-school education for the greatest possible number of children, especially those from rural areas (percentage of children from three to five years old covered by the pre-school education is 36,2%); painless transfer from the kindergarten to the school education; providing adequate support to the children diagnosed with behavioral disorders, learning disabilities and health problems; providing support for the children belonging to the groups at risk of social exclusion.
2. *Improving the education for the knowledge-based economy* including the following measures:
 - Strengthening various forms of general and professional education at all levels.
 - Introducing solutions supporting development of especially talented children.
 - Creating conditions to increase number of students interested in natural sciences.
 - Establishing a successful well-functioning system of the lifelong education.
3. *Ensuring the high-quality education system* includes the following measures:
 - Developing the culture of evaluation and improving the verification and supervision system of the education efficiency (external testing system, researches in the area of education and system of pedagogical supervision).
 - Continuous work aimed at increasing professional skills of pedagogical staff. The Ministry of Education adopted a decision regarding detailed rules in terms of the pedagogical supervision regulating required qualifications for people performing the pedagogical supervision and education research activities.

As we can see, the Polish Government is being active working on long-term education reform, combining implications of international assessments with self-evaluation of the education system.

Reactions to PISA Results in Finland

Finish students are continuously achieving the best PISA results. For example, in 2003 Finish students obtained the highest average performance on scale of the mathematical literacy, scientific literacy and reading literacy, while in 2006 they were second-ranked in mathematical literacy and first-ranked in reading and scientific literacy (Finnish average - 563 score points, OECD average - 500 score points). The University of Helsinki *Center for Education Evaluation* states that the following characteristics are the key one for their excellent results obtained in the international comparative assessments:

- Education equity: each citizen has equal opportunity to acquire education regardless the age, economic status, gender and language he/she speaks. The education equity rely on relatively small social and economic differences between various parts of the country.
- National curricula is a key document guiding the Finish education. There are no school inspectors willing to perform supervision of teachers and principles.
- Qualified homeroom teacher and specialized teachers shall have master's degree . The homeroom teachers also need the master's degree in pedagogy while specialized teachers need master's degree in the subject they are teaching.

Is it possible that the education system generating such high level of education performance is exposed to any criticism. However, yes. Even the Finish Government is willing to consider all remarks and on that basis formulate positive measures. For example, Pasi Sahlberg, a Finish senior World Bank expert for education, presented a set of critical remarks regarding the Finish education. Sahlberg started by stressing that the success of the Finish education system may be mainly explained by contextual factors and pointed out that the education

policy "should be incorporated into the common social mission fostering the education independency from other social sectors and national economic development". According to Sahlberg's opinion, it is hard to identify individual education reform or innovations that present the main driving force of the Finish education success. Unlike general observations regarding the Finish education system, he stresses that the system has remained relatively closed to impacts of what is called global education reform. Since the 1980s, not a single element of the education policy "globally" implemented in order to improve the education quality was accepted in Finland in a way done by other countries: standardization in education; greater harmonization of key curricula (reading and basic calculation operations); transfer of education innovations from one to another context; accountable government policy toward schools.

As Sahlberg stressed, he does not want to imply that education standards focused on basic knowledge and skills or focused on accountability should be avoided when searching for a way how to improve education performances nor that these ideas are completely missing from the Finish education development ideas. However, it indicates that the success in education can be obtained through approaches and policies not in compliance with what is found and promoted at the markets of the global education policy.

Potential Use of PISA Results for the Education Development: Conclusion

Presented examples indicate that results of education comparative studies are excepted and reviewed with particular attention in these, but also in other countries. Main trends in terms of reactions to the PISA results are as follows:

1. Designing special programs aimed at increasing efficiency of some segments of the education process in which the students achieved results that are below expectations.
2. It seems that dialectic nature and interweaving of global economic trends and education have been recognized everywhere and special attention attributed to impacts of the social and economic factors to results of the students from the very beginning of the education process. Poland is an example of initiating numerous specific and comprehensive mechanisms aimed at fighting the social exclusion by covering broad range of contested issues, from transport to the health care.
3. Orientation toward professional training and improving skills of teachers which does not imply that the teachers in these countries are perceived as insufficiently trained for their job, but PISA pointed out some of characteristics of the students performance to which the teachers could contribute to the greater extend than it is now.
4. Number of students per class and its internal organization are next generally excepted issue. All countries are requesting number of students per class to be reduced and to improve the student-to-teacher ratio. A lot thinking has been made regarding the internal organization of the classes involving "trend against levels", and proposed organizational solutions involve smaller, very flexible groups where the student may be given greater attention and have more attractive position.

It seems that just on the basis of the PISA results a reasonable education policy can be developed because data "cover" various aspects of the education; at least measures aimed at improving the "weakest" aspects of the system in terms of efficiency can be formulated. However, as the Finish experience shows, there is no universal, "ready-made" formula for the education success – each country is expected to find its own suitable solutions and to incorporate them into its own education tradition. The best way to find these solutions is through careful international comparisons and adjustment of some measures to the particular circumstances of each country.

ANALYSIS OF PISA FINDINGS: SERBIA AND REFERENCE COUNTRIES

This section of the report includes the analysis of the PISA 2003 and PISA 2006 study findings in which Serbia was one of the participating countries. The data from these two studies will provide insight into the student performance and functional literacy, as well as into the quality and equity of the education system in Serbia. First, we will analyze the student performance in Serbia, i.e. the competencies mastered by the students in Serbia after almost nine years of schooling. The second part provides the analysis of the quality of education in Serbia, whereby the term "quality of education" is defined in terms of the extent to which the education system in Serbia is contributing to the development of the students' competencies and functional literacy. Finally, in the third part, we will analyze whether the existing quality of education in Serbia (as defined above) is distributed equally among the students among various students in Serbia or whether some groups of students are receiving a better quality education compared to others.

Student Performance in Serbia and Reference Countries

The student performance in Serbia and other countries, selected as the reference countries for the purposes of this report, will be described first through the average student performance in the mathematical, scientific and reading literacy scales. After that, the student performance will be described through the functional literacy levels specified in the PISA study, i.e. the percentage of students from Serbia and the reference countries who achieved various functional literacy levels. The description of performance based on the literacy level allows us to identify the percentage of young people in the country that can be treated as functionally illiterate in accordance with the criterion adopted at the level of EU (i.e. the percentage of students who failed to achieve functional literacy level 2). Special attention will be given to the percentage of young people from the poorest population groups in Serbia who fail to achieve functional literacy level 2, i.e. who can be considered functionally illiterate. Finally, in this part of the report, we will analyze the contextual factors (See Box 1) that have the strongest links with the student performance in Serbia.

Average Student Performance in Serbia and Reference Countries

Table 1 shows the average student performance in Serbia and the reference countries. In addition, for the countries that participated in both PISA studies, we compared the student performance in 2006 with those from 2003. If the performance in 2006 is higher relative to 2003, it is marked with "▲", if it is lower, it is marked with "▼", and if it remained at the same level, it is marked with "=".

Table 1. Average student performance in the three domains analyzed (PISA 2003 and 2006)

Country	Mathematical Literacy			Reading Literacy			Scientific Literacy		
	2003	2006	Var	2003	2006	Var	2003	2006	Var
Serbia	437	435	=	412	401	▼	436	436	=
Croatia		467			477			493	
Slovenia		504			494			519	
Bulgaria		413			402			434	
Romania		415			396			418	
Slovakia	498	492	▼	469	466	=	495	488	▼
Poland	490	495	▲	497	508	▲	498	498	=
Norway	495	490	▼	500	484	▼	484	487	=
Finland	544	548	▲	543	547	▲	548	563	▲

Note: Student performance is described on a scale with the average of 500 score points and the standard deviation of 100, which means that approximately two thirds of all performance scores fall between 400 and 600 score points. It should be noted that the score of 500 points corresponds to the average student performance in OECD countries.

As it can be seen in the Table, while the average student performance in Serbia in the mathematical and scientific literacy domains is at a similar level (approximately 435 score points), in the reading literacy domain it is significantly lower, namely by 35 score points. What does such variance in average student performance mean? In order to be able to understand better the PISA test results, one needs to take into account the following: in the OECD countries, one year of education equals, on average, 38 score points on the reading literacy scale. Therefore, the variance of 35 score points corresponds to the effect of one school year (or nine months of education) in the OECD countries. In other words, if we compare the average level of reading literacy with that of mathematical and scientific literacy, it appears that our students had a shorter education in the domain of reading literacy. Or the other way around, our students need to be ensured one additional year of education in order for them to reach in reading literacy the same level they are at in mathematical and scientific literacy.

In terms of translating the PISA scale differences into school-year terms, it has to be stated clearly that the main purpose of such translation is to ensure better understanding of the scale of such differences. That does not imply that the main or the best solution would be to add school years to the students' education. That would prove very costly and irrational a solution. Quite the contrary, the main education policy objective should be to, first of all, improve the quality of education so that the students would develop their functional literacy to a greater level over the same number of school years. With respect to increasing the number of years of formal education for children and young people until the age of 15 could also be an option, and could be achieved through extending the duration of the compulsory preschool education.

If we compare the average student performance in Serbia with the OECD average (500 score points), we can see that the difference ranges from some 65 points (in mathematical and scientific literacy) to 99 points in reading literacy. That means that, if the quality of education in Serbia remains unchanged, the students should be provided additional 2-3 years of school in order for them to reach the OECD average student functional literacy level.

If we compare the performance of our students in 2006 with that from 2003, we can see that the performance in mathematical and science literacy remained at the same level, while the performance in reading literacy declined considerably in the period of three years. The decline of 11 score points that was recorded corresponds to the effect of one quarter of a school year. That means that, between the two PISA studies, the student performance in Serbia declined in the domain in which it was already the lowest performance domain.

If we compare the average student performance in Serbia, we can conclude that, depending on the domain, it is somewhat higher than or at the level of that in Romania and Bulgaria, but that it is considerably below that in the other countries included in this report.

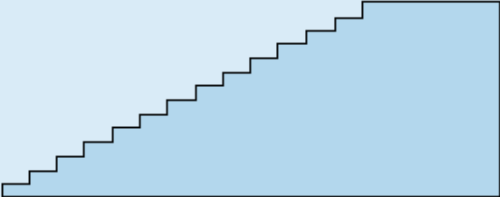
Student Proficiency Levels in Serbia and Reference Countries

In addition to the average performance, in the PISA study, student performance is described also through proficiency levels, whereby each proficiency level is defined in accordance with knowledge and skills (competencies). Each subsequent level in the proficiency level hierarchy builds up on the previous levels, which means that a student in a certain proficiency level possesses the knowledge and skills necessary for that level and all the lower levels. In the mathematic and scientific literacy domains, there are 6 proficiency levels, and in the reading literacy domain, there are 5 proficiency levels (Level 1 is the lowest level, and Level 5, i.e. 6, is the highest level), while students who failed to achieve even the lowest Level 1 are classified as "below Level 1". In addition, it should be noted that in the EU countries it is considered that a student needs to achieve at least Level 2 to be treated as functionally literate. In other words, all students classified as below Level 1 and Level 1 can be considered as functionally illiterate.

Level	Score	Mathematical literacy: performance levels
6	> 668	Students can conceptualize, generalize, and use models of complex problem situations. They can link different information sources and representations and flexibly translate among them. Students at Level 6 are capable of advanced mathematical thinking and reasoning. These students can apply this insight and understandings along with a mastery of symbolic and formal mathematical operations and relationships to develop new strategies for attacking novel situations. Students at this level can formulate and precisely communicate their actions and reflections regarding their findings, interpretations, arguments, including considering their adequacy for solving complex problem situations.
5	607-668	Students can develop and work with models for complex situations, identifying constraints and specifying assumptions. They can select, compare, and evaluate appropriate problem solving strategies for dealing with complex problems. Students at Level 5 can work strategically using broad, well-developed reasoning skills and different representations, symbolic and formal description as well as insight into the situation. They can reflect on their actions and formulate and communicate their interpretations and reasoning.
4	545-606	Students can work effectively with explicit models for complex concrete situations that may involve constraints or call for making assumptions. Students at Level 4 select and integrate different representations, including symbolic, linking them directly to aspects of real-world situations. They can construct and communicate explanations and arguments based on their interpretations, arguments, and actions.
3	483-544	Students can execute clearly described procedures, including those involving multi-step decision-making. They can select and apply simple problem solving strategies. Students at Level 3 can interpret and use representations based on different information sources. They can develop short communications reporting their interpretations and results.
2	421-482	Students can interpret and recognize situations in contexts that require no more than direct inference. They can extract relevant information from a single source. Students at Level 2 can employ basic algorithms, formulae, and procedures. Results are interpreted literally.
1	358-420	Students can answer questions involving familiar contexts where all relevant information is present and the questions are clearly defined. They are able to identify information and to carry out routine procedures according to direct instructions in explicit situations.

Picture 1. A sample Level 2 question in mathematical literacy

The bellow Picture shows a staircase of 14 steps, 252cm high:



Total height 252cm

Total depth 400cm

How high is each of the 14 steps?

Height: _____ cm

Level	Score	Scientific literacy: performance level
6	>708	Students can consistently identify, explain and apply scientific knowledge and knowledge about science in a variety of complex life situations. They can link different information sources and explanations and use evidence from these sources to justify decisions. They clearly and consistently demonstrate advanced scientific thinking and reasoning; They can use scientific knowledge and develop arguments in support of recommendations and decisions that centre on personal, social or global situations.
5	634-707	Students can identify the scientific components of many complex life situations, apply both scientific concepts and knowledge about science to these situations, and can compare, select and evaluate appropriate evidence. Students at this level can use well-developed enquiry abilities, link knowledge appropriately and bring critical insights to these situations. They can construct evidence based explanations and arguments based on their critical analysis
4	559-633	At this level students can comprehend importance and role of science or technology at the present time. They can select and integrate explanations from different disciplines of science or technology and link those explanations directly to aspects of life situations. Students at this level can reflect on their actions and they can communicate decisions using scientific knowledge and evidence.
3	458-558	Students can identify clearly described scientific issues in a range of contexts. They can select facts and knowledge to explain phenomena, implement simple models and research strategies. Students at this level can interpret and use scientific concepts from different disciplines can apply them in various situations.
2	410-484	Students have adequate scientific knowledge to provide possible explanations in familiar contexts or draw conclusions based on simple investigations. They are capable of direct reasoning and making literal interpretations of the results of scientific enquiry.
1	335-409	Students have such a limited scientific knowledge that it can only be applied to a few, familiar situations. They can present scientific explanations that are obvious and follow directly from given evidence.

Level	Score	Reading literacy: performance level
5	>626	At this level students are able to split the text into sections and combine segments of information some of which is not provided in the main text. They can conclude which information from the text is relevant for a given task. Students can evaluate information credibility. They can build meaning on the basis of language nuances. Students understand such texts fully, recognize important details and refer to details; they are able to critically evaluate them and hypothesize drawing on specialized knowledge. They can deal with concepts that are contrary to expectations and understand a complex and long text.
4	553-626	At the fourth level, students are able to combine parts of the information within the familiar context and with familiar form. They can conclude which information from the text is relevant for problem solving. They can use high-level of conclusion making based on the text in order to understand and apply classification criteria in a relatively unfamiliar context. They are able to develop the meaning of a part of the text based on the mining of the whole text. Students are capable of difficult reading tasks, such as locating concealed information in a text and dealing with ambiguities. They use formal or public knowledge to hypothesize about or evaluate a text. Students can understand a long and complex text.
3	481-552	At the third level, students are able to locate and in some cases recognize a relationship between parts of information respecting various criteria at the same time. Students are able to identify information clearly expressed, but ambiguity. They can integrate several parts of the text to identify the main idea. They can construe the meaning of a word or phrase. Students are able to compare, notice differences and classify applying various criteria. They make connections or comparisons, give explanations and can evaluate the main idea of a text. They show full understanding in relation to everyday knowledge.
2	408-480	Students can locate one or more pieces of information in a text hence satisfying several criteria. They can locate the main idea of a text, understand relations, form or apply simple categories, build the meaning within limited sections of the text where needed

		information is not clearly expressed. They can compare or connect the text with everyday knowledge or describe some characteristics of the text making reference to personal experiences and views.
1	335-407	At the first level students can locate one or several explicitly stated information in a text, usually based on a single criterion. They can reconstruct the main theme of a text or intention of the text author the subject of which is familiar to the students and information clearly visible. Students are able to make a simple connection with common, everyday knowledge. In a continued text, students can use sub-titles and some usual conventions in printed texts in order to get impression about the main idea. In a non-continued text students can pay attention to some discrete parts of information when few information are provided (maps, tables, charts) while the textual part is limited to a couple of words or sentences.

Table 2 shows the percentage of students at each proficiency level in all three domains for all countries included in this report. Considering that Level 1 and below Level 1 indicates functional illiteracy, we will focus on those levels, as well as on the highest proficiency levels (Levels 5 and 6) considering that these level indicate the students who have successfully developed their functional literacy to the highest level that is measured in the PISA study. Those students have a potential to contribute to a considerable extent to the economic, social and cultural development in the future.

Table 2. Percentage of students at each proficiency level in all three domains (PISA 2006)

	Serbia	Croatia	Slovenia	Bulgaria	Romania	Slovakia	Poland	Norway	Finland
Mathematical Literacy									
Below Level 1	19.6	9.3	4.6	29.4	24.7	8.1	5.7	7.3	1.1
Level 1	23.0	19.3	13.1	23.9	28.0	12.8	14.2	14.9	4.8
Level 2	26.8	28.9	23.5	22.0	26.5	24.1	24.7	24.3	14.4
Level 3	18.7	24.3	26.0	14.9	14.1	25.3	26.2	25.6	27.2
Level 4	9.1	13.6	19.2	6.7	5.4	18.8	1.6	17.4	28.1
Level 5	2.4	4.0	10.3	2.5	1.1	8.6	8.6	8.3	18.1
Level 6	0.4	0.8	3.4	0.6	0.1	2.4	2.0	2.1	6.3
Reading Literacy									
Below Level 1	23.6	6.2	4.4	28.8	25.6	11.2	5.0	8.4	0.8
Level 1	28.1	15.3	12.1	22.3	27.9	16.6	11.2	14.0	4.0
Level 2	28.1	27.6	24.7	22.4	27.9	25.1	21.5	23.3	15.5
Level 3	16.0	30.6	31.6	16.4	15.1	25.9	27.5	27.6	31.2
Level 4	3.9	16.5	21.9	8.1	3.2	15.8	23.1	19.0	31.8
Level 5	0.3	3.7	5.3	2.1	0.3	5.4	11.6	7.7	16.7
Scientific Literacy									
Below Level 1	11.9	3.0	2.8	18.3	16.0	5.2	3.2	5.9	0.5
Level 1	26.6	14.0	11.1	24.3	30.9	15.0	13.8	15.2	3.6
Level 2	32.3	29.3	23.1	25.2	31.8	28.0	27.5	27.3	13.6
Level 3	21.8	31.0	27.6	18.8	16.6	28.1	29.4	28.5	29.1
Level 4	6.6	17.7	22.5	10.3	4.2	17.9	19.3	17.1	32.2
Level 5	0.8	4.6	10.7	2.6	0.5	5.2	6.1	5.5	17.0
Level 6	0.0	0.5	2.2	0.4	0.0	0.6	0.7	0.6	3.9

The importance of the finding that almost one half of the students in Serbia can be treated as functionally illiterate could never be overemphasized, since such low level of reading literacy of the students in Serbia could have serious negative implications on both the individual and society overall. At the individual level, these young people could face serious difficulties at the labor market. With the existing level of reading literacy, they can apply only for jobs requiring lower-end skills. However, such jobs are in declining in the EU labor market and they will continue to decline. In addition, it can be expected that such jobs would be technologized to a considerable extent, which would reduce the need for labor force and increase the requirements in terms of necessary skills for those who are performing such activities. Considering that more and more jobs in the labor market require increasingly complex literacy levels, the young people who are functionally illiterate today can only expect to have even more difficulties in the future. In addition, the life-long learning system in Serbia is at still at a low level of development and offers very limited capacities for the students who leave the formal education system with a low literacy level to get a "second chance" later on in their lives and achieve a higher level of functional literacy. In addition to such negative implications at the individual level, a high share of functionally illiterate young people will also have negative social and economic implications – the price would have to be paid in the form of higher unemployment, higher cost of social programs, higher cost of additional training programs for the unemployed, reduced interest for investments in Serbia in due to higher cost of training and education of human resources that could be hired, and the like.

If we analyze the situation in the domain of proficiency, it can be seen that Serbia and Romania have the lowest share of students at the highest proficiency level. In the mathematical literacy domain, in Serbia, 2.8% of students achieved the highest level (Levels 5 and 6); in the scientific literacy domain, that share is 0.8% of students (Levels 5 and 6), and in the reading literacy domain, 0.3% of students achieved the highest level, i.e. Level 5. In Croatia and Slovenia, these percentages exceed those in Serbia by 2-4 and 5-12 percentage points, respectively. Even in Bulgaria, in which the average student performance is similar or lower than that in Serbia, has a higher share of students at the highest proficiency levels. Even if they are so small, such variances can have considerable implications on the social development, since the young people who are achieving the highest proficiency levels can be expected to give a substantial contribution to the development of society.

How many poor children in Serbia are functionally illiterate?

The below analyses describe the performance of the poorest group of children in Serbia (20% of students living in the most vulnerable socio-economic conditions). If these children are functionally illiterate even after 9 years of school, we can assume that their chances to avoid the "vicious cycle of poverty" would be relatively small.

Table 3. Percentage of students belonging to the poorest 20% in Serbia who are functionally illiterate (below proficiency level 2)

Students	Mathematical Literacy	Reading Literacy	Scientific Literacy
20% poorest students	65.2% (2.5)	73.9% (2.6)	59% (2.3)
Overall population	42.6%	51.7%	38.5%

Note: The first figure presents the percentage of young people belonging to the poorest 20% in Serbia who are considered functionally illiterate, while the figure in the brackets indicates the risk of these students to fall in the category of functionally illiterate even after 9 years of school, relative to the students with the average socio-economic status.

Therefore, the percent of the poorest students who belong to the category of functionally illiterate is substantially higher relative to the overall population. The rate of functional illiteracy in the poorest group of students is over 20 percentage points higher than that in the overall population. If that is expressed in terms of risk, we could say that the students in the poorest group in Serbia have a 2.3 to 2.6 higher risk of being functionally illiterate after nine years of school relative to other student population.

What contextual indicators have the strongest link with the student performance in Serbia?

The influence of the contextual factors is analyzed in relation to the literacy domain that is in the focus of the assessment for the given year in all countries included in the assessment (in 2003 – mathematical literacy, and in 2006 – scientific literacy). In this section, we will point to the most relevant findings relating to the links between the contextual factors and the student performance. All data relating to the contextual variables are collected based on a questionnaire that the students were given to fill in after they completed the PISA test.

The majority of the contextual factors are measured on the scale with the average value of 0, and the standard deviation of 1. On this scale, two thirds of the students score between -1 and +1, approximately 16% of them score below -1, and the same percent of them score above +1. The 0 score corresponds to the OECD mean, above 0 values mean that the considered factor is more pronounced in the country compared to the OECD mean, and below 0 values mean that the factor is less pronounced in that country compared to the OECD mean.

In terms of the mathematical literacy of the students in Serbia, the most relevant finding relates to the **mathematics anxiety** – the higher the students' mathematics anxiety is, the lower their performance is. The students with higher levels of mathematics anxiety are often worried that they would have difficulties with learning mathematics, they are stressed out and nervous when they are studying mathematics and they often experience the feeling of helplessness when trying to solve mathematical problems, and are concerned that they would get low marks. The negative impact of anxiety is equal to 32 score points per proficiency scale unit, i.e. if two students score on the anxiety scale differs by one point, the expected variance in their mathematical literacy would be around 32 score points. That effect is almost equal to that of one year of education in the OECD countries (or approximately 38 score points). In other words, if the students' mathematics anxiety would be reduced by one point, it would have a positive influence and increase their mathematical literacy, and that effect would almost be equal to increasing the number of years of schooling by one school year. With respect to the students in Serbia and their mathematics anxiety, it is substantially higher than the OECD mean and equals 0.28. In only 8 countries (out of 41 countries), the students have a higher level of anxiety compared to the students in Serbia. That means that the students in Serbia have a higher mathematics anxiety than their peers in other countries and that that is one of the factors that could explain why the students in Serbia are underperforming. If the anxiety level of the students in Serbia would be reduced to the OECD mean, we could expect that the average student performance in Serbia would be approximately 9 score points higher.

This finding indicating a high level of the students' mathematics anxiety seems to confirm a great deal of information available about mathematics classes in our schools. Namely, one can frequently hear both the students and their parents say that mathematics is "terrible", that the students are terrified of mathematics, that they are frustrated with continuous failure to grasp mathematics what they are expected to learn, that mathematics is too abstract, etc. The teachers of mathematics are often described as "strict", "too demanding" or as the teachers with whom many students have low grades. On the other hand, the teachers of mathematics often complain about the students saying that they are not interested in mathematics, that they are not putting in enough of an effort, that they are not studying hard enough, and that a large share of low grades in mathematics reflects the students' unwillingness to think independently and to try to master mathematics. One can sometimes get the impression that some teachers of mathematics think it is positive that many students think mathematics is "terrible". They seem to think that that would only motivate the students more to study mathematics, but it seems that the image that mathematics has gained primarily has a negative impact and tends to increase the anxiety and lower the students' motivation to study mathematics. All the above indicates the need for various measure to be undertaken to alleviate the students' anxiety towards learning, given that the increased level of anxiety has negative, rather than positive impact on learning and the student performance.

PISA 2003 study analyzed the students' motivations for studying mathematics, including both the **instrumental motivation** (studying mathematics is important because it can be a means to achieve an objective – e.g. better grades or qualifications or a better job in the future) and the **intrinsic motivation** (studying mathematics because it is interesting). However, unlike other countries, in Serbia, the students with higher levels of intrinsic and instrumental motivation do not perform better than those with lower levels of motivation. Highly motivated students will not be more successful than those less motivated, suggesting that the teaching and learning process in the schools in Serbia is not "sensitive" to students' motivation.

With respect to students' motivation, the PISA 2006 assessment that focused on the scientific literacy also had an unusual finding. Namely, the findings indicate that the students with higher levels of intrinsic and instrumental motivation, as well as the students who value science more highly tend to have lower performance in

scientific literacy! Such unusual findings could suggest that the questions in the questionnaire, pertaining to the contextual variants, cannot measure those characteristics effectively. However, on the other hand, some parts of the questionnaire functioned in a similar way in Serbia and in the other countries. Based on that we can conclude that any difficulties there might have been with filling in and understanding the questionnaire did not apply to the whole questionnaire, but only to some of its parts. In any case, the findings are sufficient for us to conclude that there is a need to understand better what type of information about the students' motivation for studying can be obtained from the PISA student questionnaire.

Quality of Education in Serbia and Reference Countries

The data that will be presented in this section of the report relates to the *quality of education* in a country, rather than to the average student performance. The quality of education is a rather broad concept that includes the quality of various aspects of education (school buildings, school equipment, curricula, textbooks, teachers, predominant teaching/learning methodology, etc.). For the purposes of the PISA study, the quality of education pertains to an important but specific aspect of the quality of education: **the extent to which education is contributing to the students' developing mathematical, reading and scientific literacy in a country.**

Therefore, the information about the quality of education in different countries, obtained in the PISA study, tells us how developed the literacy of a student would be if he/she were educated in different countries. Or, from the parents' perspective, if the parents could choose in which country they should send their child to be educated, they could estimate, based on the information about the quality of education, in which country their child would develop his/her potential to the greatest extent.

Measuring of the quality of education as defined above (the extent to which it is contributing to the development of the student) is based on the assumption that the student's performance depends at the same time on the outside-of-school factors that the school and the teachers cannot influence much (e.g. whether the child has the parents' support and the want extent, the living conditions to which the child is exposed, etc.) and on the quality of education (curricula, quality of teaching staff, quality of school management, quality of teaching, etc.). The PISA study starts from the assumption that the composite effect of the outside-of-school factors can be measured through the family socio-economic status (SES), which was proven to have a strong correlation with various characteristics of the family, residential, and culturological context to which the child is exposed. Therefore, in order to estimate the extent to which the education system itself is contributing to the students' development, it is necessary to control the impact of the outside-of-school factors on the student performance (See Box 2).

The socio-economic status (SES) is a composite measure of **the parents' qualification level, the parents' professions, the attractiveness of their jobs, their financial status, and the cultural resources available to the family.** Starting from the assumption that the socio-economic status is linked to most of the outside-of-school factors, by controlling the SES impact, one can ensure the control of the impact of the outside-of-school factors on the student performance. Therefore, the quality of education in the participating countries is assessed by statistically "adjusting" the variances in the student performance for the differences that might exist in terms of the socio-economic status (SES) of the students in these countries. That would give a measure that would indicate what levels of mathematical, scientific and reading literacy we could expect from a student if he/she were educated in different countries. Therefore, the basis for the comparison of the quality of education in different countries is the expected performance of the students whose SES *corresponds to the average socio-economic status in the OECD countries* (See Table 4).

The below Table shows the quality of education in 2003 and 2006. In addition, for the countries that participated in both PISA studies, we analyze if the quality of education increased or decreased substantially or remained at the same level in the period between the two studies. (If the quality of education improved, we used the sign "▲", and if the quality of education was aggravated, we used the sign "▼", and if the quality of education remained unchanged, the sign used is "="). With that respect, it should be taken into account that the quality of education for the development of mathematical, scientific and reading literacy is measured on the same scale that is used for scoring student performance (average 500 score points, standard deviation 100 score points).

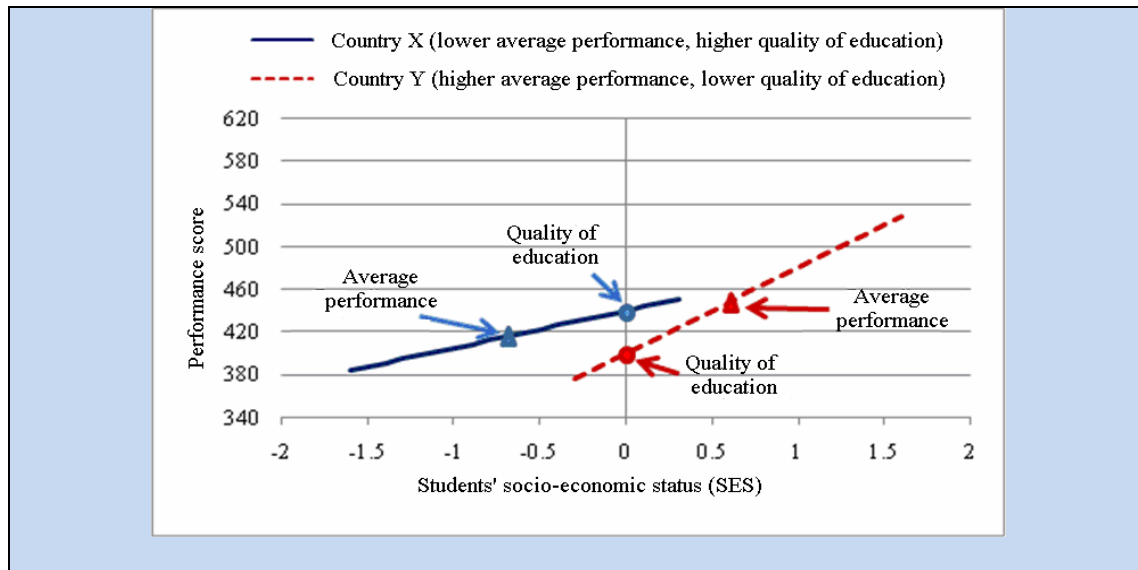
Table 4. Quality of education in Serbia and reference countries (PISA 2003 and 2006)

Country	Mathematical Literacy			Reading Literacy			Scientific Literacy		
	2003	2006	Var	2003	2006	Var	2003	2006	Var
Serbia	445	440	▼	420	406	▼	445	440	▼
Croatia		471			481			497	
Slovenia		500			490			513	
Bulgaria		424			415			446	
Romania		429			408			431	
Slovakia	503	499	▼	474	473	=	500	495	▼
Poland	499	507	▲	506	521	▲	508	510	▲
Norway	469	477	▲	474	471	▼	456	474	▲
Finland	536	540	▲	536	540	▲	540	556	▲

As it can be seen in Table 4, in 2006, the quality of education for the development of mathematical literacy in Serbia was 440 points, that for the development of reading literacy was 406 points, a for the development of scientific literacy, it was 440 points.

Box 2.**How is the quality of education measured in the PISA study?**

Overall performance is described through the average performance of the representative sample of 15-year-old students from a country that is considered. The quality of education pertains to the expected performance of the students whose SES corresponds to the average socio-economic status in the OECD countries. The below Picture presents an example of two fictional countries. In one country (Country X), the average student performance is substantially lower than in Country Y. However, based on that fact alone, we could not conclude that the quality of education in Country Y is better, i.e. that it promotes the children's development to a greater extent. The main reason for that lies in the fact that the socio-economic status of the students in Country X is considerably lower than that of the students educated in Country Y. In order to gain insight into the quality of education in both of these countries (to what extent education in both of these countries contributes to the development of functional literacy) we have to compare the performance of those students who have the same socio-economic status (i.e. socio-economic status corresponding to the average socio-economic status in the OECD countries). This comparison would indicate the level of performance that can be expected from a child with average socio-economic status if he/she were educated in these two education systems. The comparison of the student performance with the average socio-economic status in these two countries would allow us to conclude that the performance of such students in Country X is higher than that in Country Y. That suggests that the education system in Country X is contributing to a greater extent to the development of functional literacy than the education system in Country Y, which would lead to the conclusion that the quality of education in Country X is higher than that in Country Y (irrespective of the fact that the average student performance in Country Y is higher than that in Country X).



As we have already said, for easier interpretation of the data, it should be taken into account each year of school in the OECD countries, on average, “adds” some 38 score points on the scale that is used.¹ Based on that we can see that while the quality of education in Serbia in 2006 remained the same in terms of the development of scientific and mathematical literacy, it was substantially lower in terms of the development of reading literacy. This variance is approximately 35 score points and it corresponds to the effects of one year of school in the OECD countries. The fact that the quality of education is substantially lower in the domain of reading literacy can be explained partly by the fact that in many other countries the quality of education is also somewhat lower in the proficiency domain of reading literacy compared to mathematical and scientific literacy. For OECD countries, this variance is not considerable and, on average, it is equal to 6 score points, but it serves to show that many education systems are faced with certain specific difficulties in terms of promoting reading literacy in relation to mathematical and scientific literacy.²

If in the OECD countries the quality of education in the domain of reading literacy is on average some 6 score points lower relative to mathematical and scientific literacy, it can be assumed that that could be the case in Serbia as well. Even with this adjustment of 6 score points, we still have to find the reasons why the quality and efficiency of education in Serbia is lower (for approximately 30 score points) in terms of the development of reading literacy in relation to mathematical and scientific literacy.

Finally, if we compare the quality of education in 2003 and 2006, we can see that in Serbia, in the period between two PISA assessments, the quality of education was considerably aggravated in all three domains that were assessed – for approximately 5 score points in the scientific and mathematical literacy domain, and for 14 score points in the reading literacy domain.

To ensure better understanding of these findings, in the following part, they will be compared with the same information obtained in other countries selected as the reference countries for this report.

¹ The assumption used in the below sections is that the school year lasts for 9 months. With that respect, the findings will be expressed also in terms of number of school years or months of education.

² There are many explanations why many countries are showing a fall in reading literacy (e.g. the young people are under increasing influence of the electronic media which results in them reading less and, in turn, in them having less developed reading literacy, etc.), but none of the explanations is fully supported by argumentation.

Comparison with Quality of Education in OECD and Scandinavian Countries

If the quality of education in Serbia is compared with the OECD countries, it is evident that the quality of education in our country is lower for approximately 1.6 school years (approximately 13 months of education) in terms of the development of mathematical and scientific literacy, and for approximately 2.2 school years (approximately 20 months of education) in terms of the development of reading literacy. The analysis of PISA 2006 data shows that one year of education in Serbia (PISA 2006, Vol. 1, Annex A1, Table A1.2) equals, at best, 33 score points on the reading literacy scale.³ This information shows that our students (if the existing quality of education in Serbia was maintained) should be ensured additional 16, i.e. 22 months of education (approximately 2 school years) until the age of 15 to be able to catch up with their peers in the OECD countries in terms of literacy.

The Scandinavian countries have a longstanding tradition of the development of education and considerable investments in this sector. For the purposes of comparison, we have selected Finland (that is traditionally the "PISA champion") and Norway, a country with high standard and high investments in education, but with a considerably lower quality of education than that in Finland. As it can be seen in Table 4, the difference in the quality of education in Finland and in Serbia is over 100 points which translates into 2-3 year of education. In addition, in the period between two PISA studies, the quality of education in Finland was improved in all three domains that are assessed. On the other hand, even if Norway has approximately 20% higher GDP per capita than Finland and invests 33% more funds per student, the quality of education is substantially lower than that in Finland.

Comparison of Quality of Education in the Region

The education systems in the former Yugoslav republics, Slovenia and Croatia, originate from the similar education system as the education system in Serbia. The education system in Slovenia has undergone gradual but deep-reaching reforms since the beginning of 1990s, while the compulsory education in Croatia has been undergoing substantial reforms in the last 5 years. Finally, considering that the social and economic development of this region of South Europe, and particularly the need to attract more foreign direct investments, it is assumed that Slovenia and Croatia would, in a sense, present the main competition to Serbia in the region. One of the important factors that will determine Serbia's success in that competition will by all means be the quality of human resources, and particularly the proficiency level and literacy of the young people.

Table 5. Comparison of the quality of education in Serbia and the quality of education in Croatia and Slovenia

Country		Mathematical Literacy		Reading Literacy		Scientific Literacy	
		2006	Var	2006	Var	2006	Var
Serbia	vs.	-31	▼	-75	▼	-57	▼
Croatia		(0.8)		(2.0)		(1.5)	
Serbia	vs.	-60	▼	-84	▼	-73	▼
Slovenia		(1.6)		(2.2)		(1.9)	

Note: The upper figure presents the difference in the quality of education expressed in points, while the lower figure (in brackets) presents the difference in the quality of education expressed in school years.

³ The contribution of one school year is estimated at approximately 17 score points, but the standard error for this estimate is relatively high (approximately 8 points) which means that one school year can be equal, at best, to approximately 33 points ($17 + 2 \cdot 8$).

If the quality of education in Serbia is compared with the quality of education in Slovenia and Croatia (Table 5), it can be noted that the quality of education in Serbia is lower in all three domains that were assessed. The lowest difference in quality is that in the development of mathematical literacy in Serbia and Croatia (31 points in favor of education in Croatia or just under one school year), while the greatest difference is that in terms of the extent to which education in Serbia and in Slovenia promotes the development of the students' reading literacy. That difference is as much as 84 points or almost 2.2 school years. Therefore, the education system in Serbia promotes the development of mathematical, scientific and reading literacy in children to a substantially lower extent. Finally, it can be noted that in Serbia, unlike in Slovenia and Croatia, the quality of education in the domain of reading literacy is considerably lower than that in the other two domains.

On the other hand, it is useful to compare the quality of education in Serbia with the quality of education in other two countries in the region, Bulgaria and Romania, which are at the similar level of economic development as Serbia (for all three countries, GDP per capita is approximately USD 8,000). The comparison shows that the quality of education in Serbia is very similar to the quality of education in Bulgaria, and somewhat higher than the quality of education in Romania (Table 6). However, there are some differences. The quality of education in Serbia is higher than the quality of education in Romania and Bulgaria in the domains of mathematical and scientific literacy, and that difference is 10-15 points (approximately one third of a school year). In the domain of reading literacy, the quality of education is at the level of that in Romania, and somewhat lower than that in Bulgaria (the difference is approximately 9 points or one fifth of a school year). In addition, all three countries show a trend of lower quality of education in reading literacy, than in the other two domains. We can assume that in these countries, such low level of reading literacy could be a limiting factor for further improvement of education. Namely, students with low capacities to understand the text they are reading may have considerable difficulties in their future work and studying of any other matter or subject. In such conditions, even if the quality of education is improved in other domains, a number of students will not be able to use that opportunity and benefit from the improvements due to their low reading literacy level. Finally, in the domain of scientific literacy, the quality of education in Serbia is somewhat higher than that in Romania (for approximately 6 points or one fifth of a school year), but also somewhat lower than that in Bulgaria (for 9 points or one fifth of a school year).

Table 6. Comparison of the quality of education in Serbia and the quality of education in Bulgaria and Romania

		Mathematical Literacy		Reading Literacy		Scientific Literacy	
Country		2006	Var	2006	Var	2006	Var
Serbia	vs.	+16	▲	-9	▼	-6	▼
Bulgaria		(0.4)		(0.2)		(0.2)	
Serbia	vs.	+11	▲	-2	=	+9	▲
Romania		(0.3)		(--)		(0.2)	

Note: The upper figure presents the difference in the quality of education expressed in points, while the lower figure (in brackets) presents the difference in the quality of education expressed in school years.

Therefore, if we compare the quality of education in Serbia with the quality of education in the countries in the region, we can conclude that while it is lower than our Western neighbors, it is similar to our Eastern neighbors. With that respect, we should take into account that education in Slovenia, Romania and Bulgaria underwent intensive reforms from the beginning of the 1990s, and that these countries had considerable investments in improvement of education. The PISA assessment findings seem to suggest that the reforms in Bulgaria and Romania were not as effective as those in Slovenia irrespective of the considerable financial investments made.

Comparison with Former Socialist Countries in Central and Eastern Europe

The comparison of the quality of education in Serbia with the quality of education in the former socialist countries in Central and Eastern Europe, such as Poland and Slovakia, may be useful considering that these countries started their education reforms from a similar, socialist type education system. On the other hand, these countries initiated comprehensive education reforms from 1990s. Finally, unlike Slovenia, Croatia, Bulgaria and Romania, Poland and Slovakia participated also in the PISA 2003 assessment, which allows us to see whether the quality of education changed in the period between 2003 and 2006.

As it can be noted in Table 7, the quality of education in Serbia is substantially lower than the quality of education in Poland and Slovakia in all three domains that were assessed. In the domains of mathematical and scientific literacy, the quality of education in Serbia is approximately 60-70 points lower than that in Poland and Slovakia (1.6-1.8 school years). In the domains of reading literacy, the quality of education in Serbia is lower in relation to Slovakia for almost 70 points (approximately 1.6 school years), while in relation to Poland it is lower for as much as 115 points or 3 school years. However, if we compare the quality of education in the domain of reading literacy in Serbia and in Poland, it can be concluded that a large share of that difference is due to the fact that the quality of education in Serbia in reading literacy is lower than in the other two domains (for approximately 35 points), while in Poland, the quality of education in reading literacy is somewhat higher than in the other two domains (for approximately 10-15 points). On the other hand, we can note that Slovakia also has a ratio of the quality of education in the three domains that is similar to that in Serbia, i.e. the quality of education in reading literacy is about 25 points lower than in the other two domains.

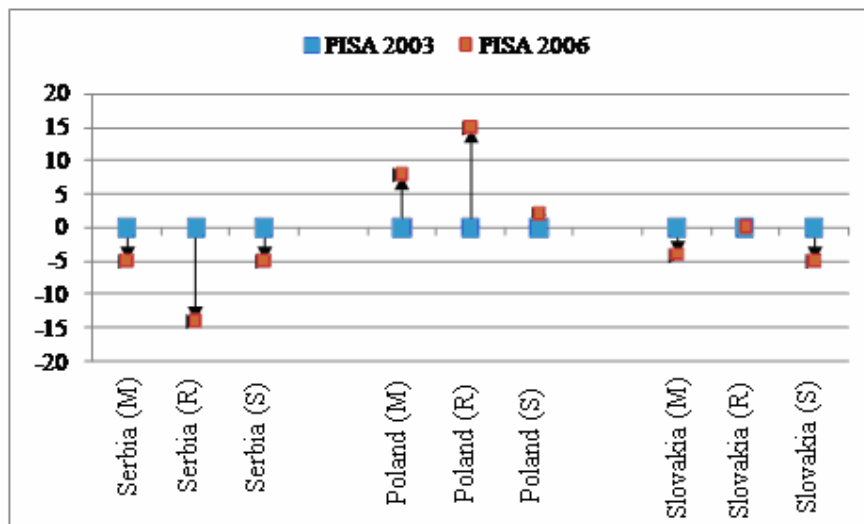
Table 7. Comparison of the quality of education in Serbia and the quality of education in Poland and Slovakia

		Mathematical Literacy		Reading Literacy		Scientific Literacy	
Country		2006	Var	2006	Var	2006	Var
Serbia	vs.	-67	▼	-115	▼	-70	▼
Poland		(1.8)		(3.0)		(1.8)	
Serbia	vs.	-59	▼	-67	▼	-55	▼
Slovakia		(1.6)		(1.8)		(1.4)	

Note: The upper figure presents the difference in the quality of education expressed in points, while the lower figure (in brackets) presents the difference in the quality of education expressed in school years.

Including Poland and Slovakia in this report will allow us to identify also the changes in the quality of education in Serbia between 2003 and 2006, in the context of the changes that occurred in Poland and Slovakia in the same period (Figure 1).

Figure 1. Changes in the quality of education between 2003 and 2006 for all three domains in Serbia, Poland, and Slovakia



Note: Changes in the quality of education in specific domains (M – mathematical literacy; R – reading literacy; S – scientific literacy) presented in relation to the quality of education in these domains in 2003.

As you can see, the quality of education in Serbia is lower than it was in 2003 in all three domains that were assessed. That means that in the period between the two assessments there were negative factors in force that brought the quality of education in Serbia down, and particularly is the domain of reading literacy. Based on the available data, we cannot identify with certainty the exact reasons that caused the decline in the quality of education. However, we should take into account that the two generations of students that participated in the PISA tests in 2003 and 2006 studied in accordance with the same curricula and used the same textbooks (these generations are not covered by the revised curricula and textbooks), and that they were taught by more or less the same teaching staff. In that sense, the decline of the quality does not reflect these structural elements, and it could reflect the impact of some other factors – for example, in 2003, education was one of the most important social issues due to important reform activities, and the students' and teachers' motivation could have been higher in 2003 than in 2006, etc.

In the same period, Poland managed to improve the quality of its education in all three domains – a relatively small improvement in the domain of scientific literacy, a more significant improvement in the domain of mathematical literacy (approximately 5 score points), and the greatest improvement in the domain of reading literacy (approximately 15 score points or 0.4 school years). On the other hand, Slovakia shows a small but significant fall in the domains of mathematical and scientific literacy, while the quality of education in the domain of reading literacy remained at the same level.

Quality of Education in Serbia: Conclusion

Based on the above data and analyses, we could formulate the following main conclusions:

- The quality of education in Serbia is better in the domains of mathematical and scientific literacy than in the domain of reading literacy (for almost one school year).
- The quality of education in 2006 is lower than that in 2003 in all three domains – in the domains of mathematical and scientific literacy for approximately 5 score points (almost one month of school), while the quality of education in the domain of reading literacy declined for 15 points or almost one third of a school year (it has to be noted that the greatest decline in quality occurred exactly in the domain in which the quality of education in Serbia in 2003 was at the lowest level).
- The quality of education in Serbia is similar (with some minor differences) to the quality of education in Bulgaria and Romania (which are at a similar level of economic development – for more details, see the section of cost/benefit analysis), but lower in relation to Croatia and Slovenia for one to two school years!

- The comparison with Poland and Slovakia showed that the quality of education in Serbia is substantially lower than in these countries. The difference is equivalent to approximately 1.5-2 school years, while the quality of education in the domain of reading literacy is lower than that in Poland for approximately 3 school years!
- Unlike Serbia and Slovakia, Poland succeeded in improving the quality of education in all three domains, and particularly in the domain of reading literacy.
- The comparison with the most developed economies with a very high quality of education (OECD and Scandinavian countries) shows a substantial gap, equivalent to two to three school years.

Equity in Education in Serbia and Reference Countries

One of the important issues for identifying the situation in education in Serbia is the level of equity in education. For the purpose of this report, equity in education is defined as *the extent in which the existing quality of education in a country is equally distributed (made accessible) among students with different socio-economic status*. In other words, we need to find the answer to the question whether children of various socio-economic status have equal opportunities to develop their mathematical, scientific and reading literacy.

In the ideal education system, the quality of education would be equal for all children irrespective of their SES. That would mean that the opportunities for the development of important vital competencies acquired by children through education do not depend on the factors outside of the student's choice (for example, parents' education level, financial status of the family, etc.). However, in equity assessment, in real conditions, this ideal situation cannot be used as a benchmark. That is why, equity in education Serbia will be assessed in relation to the equity levels in other countries.

How Significant is Variance in Student Performance in Serbia and Reference Countries?

In any education system, there are larger or smaller differences between students in terms of their individual performance. It can be argued that the education system is more equitable if the overall differences between the students in terms of their performance are less significant.

Table 8 shows the total variance indicating the extent of differences between the students in a country in terms of their performance. The differences that exist between the students are expressed in relation to the mean variance for OECD countries. Above 100% figures indicate the difference between the students in the country are greater than those in the OECD countries, and below 100% figures indicate that the education system in the country succeeds to ensure, to a greater extent than in the case of the OECD countries, less significant differences in performance between individual students.

Table 8. Total student performance variance (total variance) in all three domains that were assessed (PISA 2006)

Country	Mathematical Literacy	Reading Literacy	Scientific Literacy
Serbia	101%	86%	80%
Croatia	84%	81%	82%
Slovenia	96%	80%	107%
Bulgaria	122%	141%	126%
Romania	85%	87%	73%
Slovakia	107%	113%	96%
Poland	90%	103%	90%
Norway	99%	110%	99%
Finland	78%	68%	81%

If we analyze the data for Serbia, it is evident that the largest variance in student performance is that in the domain of mathematical literacy, with the variance in Serbia exceeding the variance in OECD countries, while the variance in the other two domains is lower than that in the OECD countries. Even if we assume for the domain

of reading literacy that such lower variance could be explained at least partly by the fact that the average student performance in Serbia in that domain is substantially lower, that is not the case of scientific literacy. Namely, the average student performance in Serbia in that domain is at the level of that in the domain of mathematical literacy, but the variance is substantially lower. That indicates that the education system in Serbia in 2006 was less equitable in terms of the development of mathematical literacy than in case of scientific and reading literacy. In that context, it should also be noted that in 2003 the total variance in Serbia in the domain of mathematical literacy was considerably lower (approximately 83%), i.e. at the level of the variance in the domains of scientific and reading literacy. That means that the problem with higher variance in the domain of mathematical literacy occurred between two PISA tests. It is difficult to identify the main reason with certainty, but it has to be taken into account that between the two tests there were no substantial changes in terms of the curriculum or the textbooks used by these two generations of students (the generation tested in 2003, and that tested in 2006).

If we compare Serbia with other countries, we can note that the variance in student performance recorded in Serbia in the domain of reading literacy is lower, while the variance in the domain of scientific literacy in Serbia is almost at the level of that in Finland. However, it can be noted that the variance in the domain of mathematical literacy is substantially lower than in Bulgaria, and somewhat lower than in Slovakia, while in the other countries, the situation is better than in Serbia. The lowest variance is that in Finland, Croatia, and Romania, and here it also has to be taken into account that the students in Croatia, and especially in Finland, outperform substantially the students in Serbia.

How Significant is the Impact of Socio-economic Status on Student Performance?

Table 9 shows the relation between student performance and the students' socio-economic status (SES). In that respect, it has to be noted that the student's socio-economic status is described on the scale from -3 to +3 with normal distribution, whereby 0 is the average socio-economic status for OECD countries, and the standard deviation is 1. That practically means that approximately two thirds of all students in the OECD countries has SES in the range between -1 and +1, while approximately 16% of students in the OECD countries has SES below -1 (those could be considered poor) and the same share has SES above +1 (those could be considered students from well-off families).

The measures presented in Table 9 show the difference in the performance of students whose difference in SES is equal to 1. The lower this measure is, the higher the equity in education in the country. In the ideal situation, this value would be 0, which would mean that the students with different SES are performing equally and that their performance is not linked with their socio-economic status. Table 9 shows the data for 2003 and 2006, based on which we can see the changes that occurred in the period between the two tests in this respect (if the difference in the performance of the students with different SES is less significant, that means increased equity and it is marked with "▲"; if the difference is larger, that means that equity is lower, and it is marked with "▼", and if the situation in terms of equity remained unchanged, that is marked with "=").

Table 9. Equity in education in Serbia and reference countries (PISA 2003 and 2006)

Country	Mathematical Literacy			Reading Literacy			Scientific Literacy		
	2003	2006	Var	2003	2006	Var	2003	2006	Var
Serbia	36	35	=	34	36	=	35	33	=
Croatia		32			32			34	
Slovenia		42			39			46	
Bulgaria		47			55			52	
Romania		37			32			35	
Slovakia	53	46	=	51	45	=	58	45	▲
Poland	45	38	▲	46	42	=	52	39	▲
Norway	44	35	▲	44	38	=	47	36	▲
Finland	33	32	=	30	29	=	34	31	=

Equity in education in Serbia is fairly equalized in all three domains that were assessed and is approximately 35 points. Considering that the contribution of one year of school is approximately 38 points, we can conclude that such difference is equivalent to almost one school year. The effect of SES on the quality of education in Serbia remained at the same level from 2003. Other countries show similar trends as well. The exception is Poland and Norway that succeeded in lowering the differences between the two assessments, i.e. improved equity in education in the country, particularly in mathematical and scientific literacy, while equity in the domain of reading literacy remained the same. Besides Poland and Norway, Slovakia also improved equity in its education, namely, in scientific literacy.

The equity level in the OECD countries is slightly lower than that in Serbia and ranges from 40 points in reading literacy to 38 points in mathematical and scientific literacy. That means that in Serbia education is somewhat more equitable than in the case of the OECD countries.

Variance in Performance of Students with Different Socio-economic Status

As important aspect of equity is the performance gap between the students from different groups in accordance with their socio-economic status. In order to find the answer to that question, the students were divided in 7 groups in accordance with their SES: (1) 10% highest SES, (2) 10% high SES, (3) 20% above average SES, (4) 20% average SES, (5) 20% below average SES, (6) 10% low SES, and (7) 10% lowest SES.

Table 10 shows the following information: socio-economic status (SES column) for each of the seven groups and the average group performance in 2003 and 2006 for each domain assessed. In addition, the Table includes also the variance in performance in 2003 and 2006 for each SES group. Finally, in the bottom part of the table shows that difference in performance between the 10% of the students with the highest and the lowest SES, and the difference in performance between the 10% of the students with the lowest SES and the students with average SES.

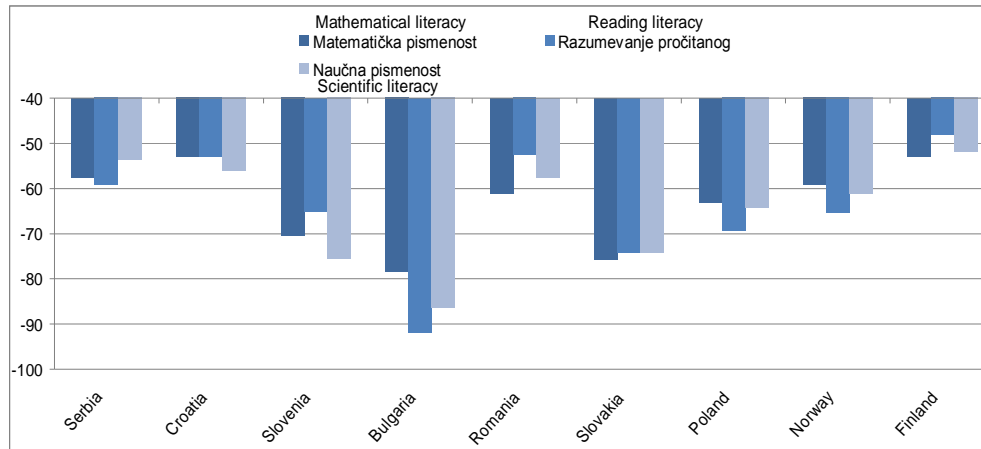
If we compare the performance of the lower and the highest SES groups, we can note that, both in 2003 and in 2006, the difference was around 100-110 score points (almost 3 years of school), while the gap between the 10% of the students with the lowest SES in relation to the performance of the average SES students was around 55-60 score points (approximately 1.5 years of school). With that respect, it has to be noted that the performance of the students from the lowest SES group is very low – around 380-390 score points in mathematical and scientific literacy, and about 350 score points in reading literacy.

Table 10. Serbia: Performance of students from different SES groups (PISA 2003 and 2006)

SES Group	SES	Mathematical Literacy			Reading Literacy			Scientific Literacy		
		2003	2006	Var	2003	2006	Var	2003	2006	Var
10% highest SES	1,41	496	489	-7	468	457	-11	493	487	-6
10% high SES	0,75	472	466	-6	445	433	-12	470	466	-4
20% above average SES	0,20	452	447	-5	427	413	-14	451	447	-4
20% average SES	-0,31	434	429	-5	409	395	-14	433	430	-3
20% below average SES	-0,73	419	414	-5	395	380	-15	419	417	-2
10% low SES	-1,10	406	401	-5	382	366	-16	406	404	-2
10% lowest SES	-1,64	386	382	-4	364	347	-17	387	386	-1
Bottom vs. top group		-110	-107		-104	-110		-106	-101	
Bottom group vs. average quality		-59	-58		-56	-59		-58	-54	

The difference in the quality of education for the 10% of the students with the lowest SES in relation to the overall quality of education in Serbia ranges between 55 and 60 points, which is slightly higher than in Finland, which has the lowest variance of approximately 50 points. The variance recorded in Serbia is at the level of that in Croatia and Romania, and it is substantially lower than that in Slovakia, Slovenia, and Bulgaria, which have the variance of more than 70 points, and in Bulgaria, in the domain of reading literacy, it goes as high as 90 points. Therefore, we can conclude that gap between the quality of education for the 10% of the students with the lowest SES and the quality of education in Serbia is acceptable in comparison with the situation in other countries.

Figure 2. Variance in the quality of education provided in other countries for the children with the same level SES as the poorest 10% in Serbia



Secondary Effects of Students' Socio-economic Status

The secondary effects relate to the impact that the socio-economic status can have on the students' educational aspirations. The question is do the students in Serbia with similar performance but with different SES have the same probability that they will enroll in the general-profile academic secondary schools that usually leads to continuance of education and provides a higher quality education.

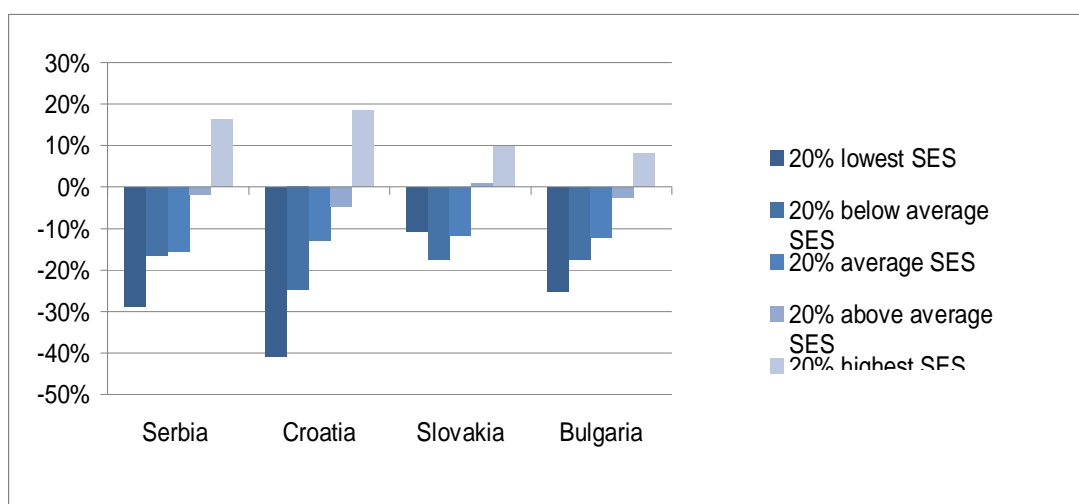
In order to check whether the secondary effect of SES is evident in Serbia, and if so, to what extent, the following analysis was conducted. First, the students in Serbia were divided into 5 SES quintiles, while in other countries groups of students were identified with the same level SES as the quintiles identified in Serbia (to ensure comparability with the SES quintiles identified in Serbia). In addition, in each country, we identified 20% of students with the highest average performance in all three domains. Those were, therefore, the most successful students the majority of whom would, if their competencies were the only deciding factor, continue their education and move to the general academic secondary education system. The underlying assumption in this analysis is the following: if the secondary effect of SES on equity in education is not present, the probability that they would enroll in gymnasium should be the same for all the students from the most successful 20% group (ISCED 3A) *irrespective of their socio-economic status*. The analysis was carried out on the basis of the PISA 2006 assessment, and it included only those countries in which the 15-year-old students, i.e. the PISA assessment target group, are distributed to different profiles of secondary education (Serbia, Croatia, Slovakia, and Bulgaria). The data is presented in Table 11 and Figure 3.

Table 11. Probability that the highest PISA performing students from different SES quintiles will enroll in general-profile academic (gymnasium) secondary schools, relative to average enrollment rate for this student group (ISCED 3A)

SES group	Serbia	Croatia	Slovakia	Bulgaria
20% lowest SES	-29% (-3.4)	-41% (-5.7)	-11% (-1.7)	-25% (-2.9)
20% below average SES	-16% (-1.9)	-25% (-2.8)	-18% (-2.2)	-17% (-2.1)
20% average SES	-16% (-1.9)	-13% (-1.7)	-12% (-1.8)	-12% (-1.7)
20% above average SES	-2% (-1.1)	-5% (-1.2)	+1% (1.0)	-2% (-1.1)
20% highest SES	16% (2.0)	18% (3.2)	10% (1.9)	8% (1.5)

Note: Five SES groups were identified on the basis of the SES distribution in Serbia, which means that in other countries the groups of students were identified with the same SES as the quintiles in Serbia.

The first percentage indicates the variance in the enrollment rate in gymnasiums for the relevant SES group relative to the average rate for all 5 SES group. The negative percentages indicate that the share of students in the relevant SES group who enrolled in gymnasiums is lower than the average share for all SES groups. The number in brackets indicates the same information expressed in terms of probability that a student from the relevant SES group will enroll in a gymnasiums – for example, if the number in brackets is 2, that means that the students from that SES group have a twice as high probability to be enrolled in gymnasiums, and if the number in brackets is -2, that would mean that the children from that SES group have a two times lower probability to be enrolled in gymnasiums.

Figure 3. Enrollment rate for the highest PISA performing students from different SES quintiles, relative to average enrollment rate for this student group in general-profile academic (gymnasium) secondary schools (ISCED 3A)

As it can be seen from Table 11, in Serbia, the share of the most successful students with the lowest SES, enrolled in gymnasiums in 2006 is 29 percentage points lower than the average for the group, while the share of the highest SES students enrolled in gymnasiums is 16 percentage points higher than the average. We must not forget that these students had the highest PISA scores, which means that there must be some other reason why they did not enroll in gymnasiums, and not inadequate knowledge and skills. When that is translated in

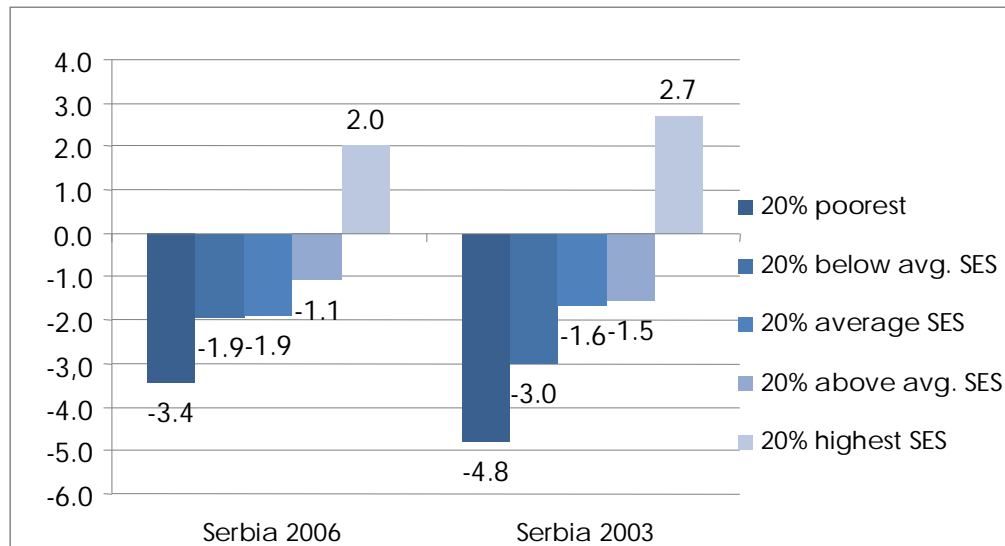
opportunity terms, we can see that the lowest SES children had 3.4 times lower opportunity to enroll in gymnasiums in 2006 relative to the average. On the other side, the opportunity for the highest SES children was two times higher than the average.

When we compare the opportunities of the students in other countries, the situation in Serbia is similar to the situation in Bulgaria, while the situation in Slovakia is slightly better. Still, the situation in Serbia is far more favorable than the situation in Croatia where the children with the lowest SES have a five times lower opportunity to enroll in a gymnasium.

Therefore, it appears that the exceptionally successful students who belong to the poorest groups, in spite of their obvious potential to continue education and reach the highest level of education, enroll at a considerably higher rate into vocational secondary schools. The most likely reason for that lies in the fact that these students, because they are poor, cannot afford longer education, and therefore, they are unlikely to develop their full potential. However, this is both a personal problem for these students and a social problem, considering that it means that the potentials of the new generations will not be developed to the extent that would, with small interventions, be possible. For example, one possible solution could be to introduce grants for poor students who have demonstrated high potential in the course of their compulsory education. The main purpose of these student grants would be to ensure such conditions for these students that they would not be forced to opt for the secondary school that is below their educational potential.

What was the situation in Serbia in 2003 in terms of the secondary effect of SES on the enrollment of students in gymnasiums (See Figure 4)? It can be seen that, in this period, the situation in Serbia significantly improved, as a result of significant improvement of the opportunities of the most successful students from the two lowest SES quintiles to enroll in gymnasiums.

Figure 4. Comparison of the opportunity of children from different SES quintiles to enroll in gymnasiums 2003–2006



To What Extent Quality of Education Depends on the School the Child is Attending?

The next important aspect of equity in the education system relates to the extent to which student performance depends on the school the student is attending ("the school effect" or "between-school variance").

Namely, in the ideal situation, student performance should not depend on the school the students are attending, but only on the individual factors such as commitment, motivation, competences, method of learning, etc. That means that in an equitable education system, schools provide the same or approximately the same quality of education to their students. That is why one of the important parameters for the assessment of equity in education in a country is the extent to which the student performance variability depends on the variance between schools.

However, this measure (hereinafter: "between-school variance") has to be considered together with another measure. Namely, in some countries, students enrolling in different schools may have substantially different socio-economic status – the students with a higher social status may enroll predominantly in schools offering a higher quality of education and *vice versa*. In such conditions, there is a higher probability that the poor children will be educated in the schools with a lower quality of education, which would only make it even more difficult for them to break out of the "vicious cycle of poverty." In that case, the between-school variance would be the result of some implicit or explicit social mechanisms, "directing" the children to enroll in certain schools in accordance with their SES.

In this part of the analysis, we will consider the extent to which the student performance in all three domains depends on the school they are attending (or the extent of the "between-school variance" in Serbia) and the extent to which such "between-school variance" could be explained by the student SES variance.

Figures 5, 6, and 7 show between-school variance and the extent to which such variance could be explained by the SES variance of the students attending these schools (dark blue columns show "between-school variance", while light blue columns show the extent to which such variance can be explained by the student SES variance).

Figure 5. Student performance variance in mathematical literacy explained by "between-school variance" (PISA 2006), in percent

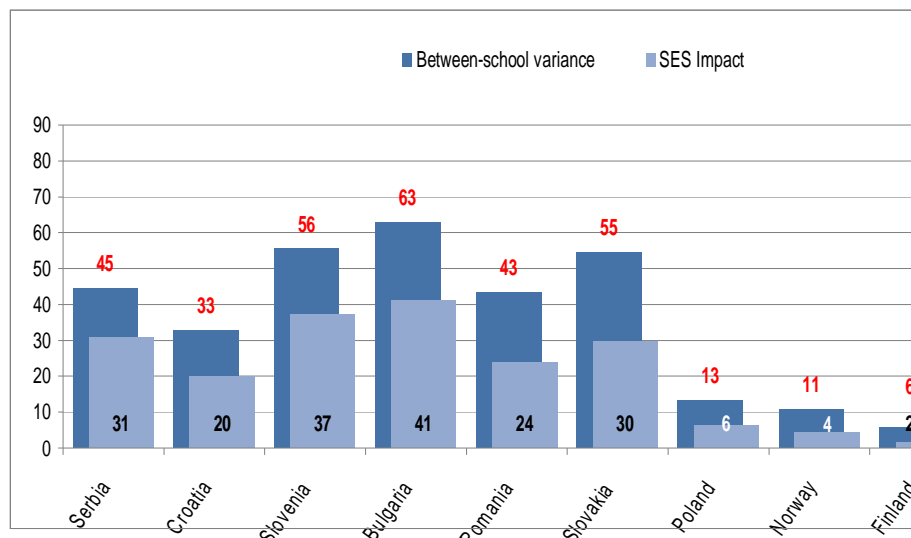


Figure 6. Student performance variance in reading literacy explained by "between-school variance" (PISA 2006), in percent

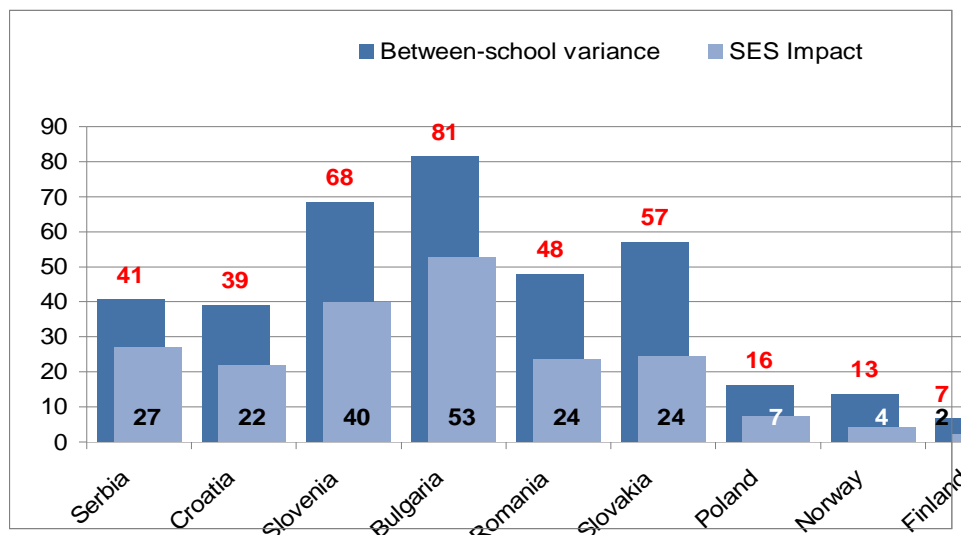
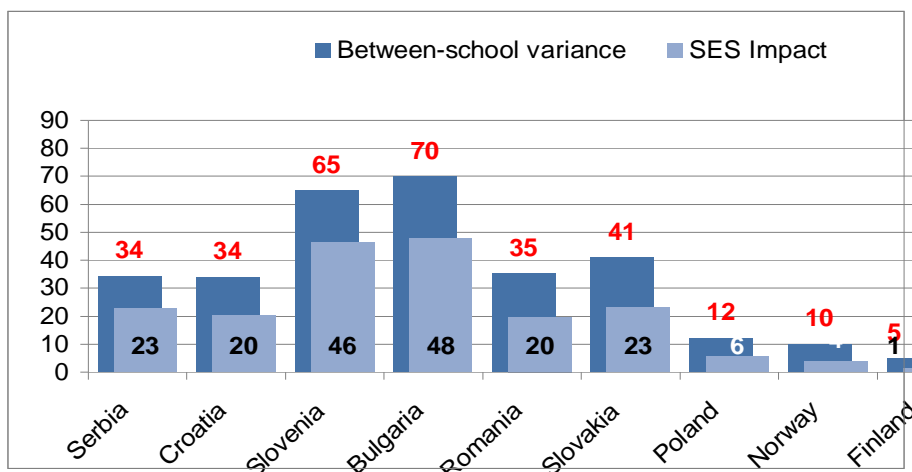


Figure 7. Student performance variance in scientific literacy explained by "between-school variance" (PISA 2006), in percent



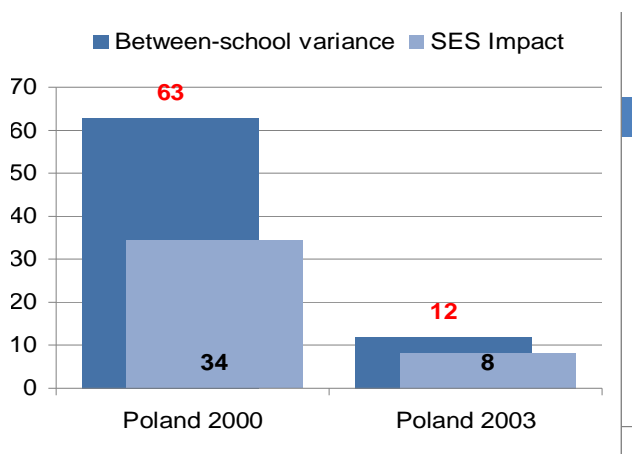
The most significant between-school variance in Serbia is recorded in the domain of mathematical literacy (45%) and it is 8 percentage points higher than the OECD mean. In the domain of reading literacy, the between-school variance is 41% or approximately 3 percentage points higher than the OECD mean. The smallest variance is recorded in the domain of scientific literacy (34%), at the level of the OECD mean.

Compared to other countries, the school effect in Serbia is substantially lower than in Slovenia, Slovakia, and Bulgaria, with the school effect in Bulgaria exceptionally high. On the other hand, compared to Croatia, the "between-school variance" is at the similar level in the domains of reading and scientific literacy, while Serbia shows a substantially higher variance in the domain of mathematical literacy. However, in these countries, the "between-school variance" is substantially higher than in case of Poland, Norway, and Finland. For instance, compared to Poland, which shows the highest school effect of the three countries, the between-school variance in Serbia is 2-3 times higher. Compared to Finland, which shows the lowest school effect, the "between-school variance" in Serbia is 6-7 times higher.

However, it should be emphasized that such significant "school effect variance" in Serbia in relation to Poland, Norway, and Finland can be explained to a great extent by the fact that the 15-year-olds in these countries are still in the compulsory education system (i.e. all the students who participated in the PISA assessment attend the same education program), while the assessment in Serbia covered secondary school students attending different secondary education programs on the basis of preselection (based on their previous school attainment and qualification examination scores). That means that the current enrollment system in Serbia itself generates certain variance between schools, since different type secondary schools enroll students with different competences. That is most likely the explanation of a relatively high impact of the students' SES on the between-school variance. About two thirds of "between-school variance" can be explained by the variance in the students' SES. However, this finding only confirms that in Serbia there is a higher probability that a lower SES level student will enroll a vocational secondary school, and that a higher SES level student will enroll in an academic profile secondary school if they have the same performance level (which has already been discussed in the analysis of the "secondary effects of the students' socio-economic status").

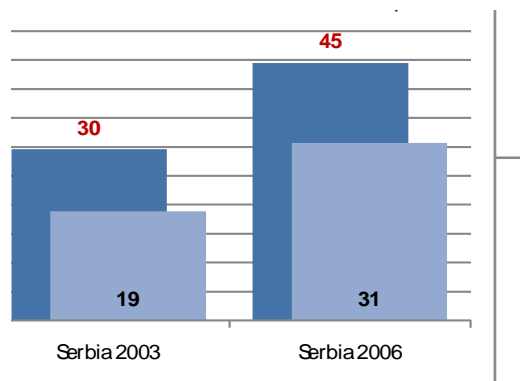
In support of the above conclusion that the school effect can be explained to a great extent by the fact that the children tested in Serbia have already passed through preselection, we should consider the case of Poland. In Poland, the students who participated in the PISA assessment in 2000 were enrolled in different profile secondary education (similar as in the case of Serbia), while the students who participated in the PISA assessment in 2003 attended the final grade of the compulsory education. That change was the result of the structural reforms that were implemented in Poland in the period between the two assessments, under the compulsory education was extended for one additional year. Figure 8 shows the "between-school variance" in mathematical literacy and the impact of SES of such variance in Poland in 2000 and 2003.

Figure 8. Total "between-school variance" and SES impact in mathematical literacy in 2000 and 2003, as a result of structural reforms (extending compulsory education until 16 years of age)



Finally, what was the situation in Serbia in 2006 in relation to 2003? Considering that during this period the variance in student performance remained at the same level in scientific and reading literacy, while substantially increasing in mathematical literacy, we focused on the latter (Figure 9).

Figure 9. Total "between-school variance" and SES impact in mathematical literacy in 2003 and 2006



Similarly as with other aspects of equity in education in the domain of mathematical literacy, we can note that the situation in 2006 is less favorable than in 2003. In 2003, variance in the quality of education in individual schools made up for 30% of the total student performance variance, relative to 45% of total variance in 2006 (50% increase). The situation with the impact of SES on between-school variance is similar (from 19% to 31% increase).

Equity in Education in Serbia: Conclusion

In this section we will analyze the level of equity in education in Serbia, i.e. the extent to which education in Serbia is distributed (un)equally among the students irrespective of their socio-economic status. Based on the analysis of various aspects of equity in education in Serbia, the main conclusions are the following:

- **The total variance in student performance** is more significant in mathematical literacy than in the other two domains. Compared to other countries, the student performance variance in scientific and reading literacy is lower than the OECD mean and is among the lowest compared to other countries (including Finland). In mathematical literacy, the student performance variance is slightly above the OECD mean.
- **The impact of the students' socio-economic status on their performance** in Serbia is equalized in all three domains that were assessed and has not changed substantially in relation to 2003. In terms of the impact of the students' SES on their performance, Serbia ranks among the countries with lower SES impact.
- **The variance in performance of children with different SES** in Serbia is quite evident. If we compare the student performance of the 10% lowest SES students in relation to the 10% highest SES students, the variance is in the range of 100-110 score points, which is equivalent to approximately 2.5 years of school. In the period between 2003 and 2006, the variance in performance of the lowest SES and the highest SES groups was slightly reduced in mathematical and scientific literacy, while it increased in the domain of reading literacy. However, the comparison of Serbia with other countries shows that the variance is among the lowest.
- **The secondary effect of socio-economic status.** In Serbia, the students ranked based on their performance in the most successful 20% based on their performance, but who belong the lowest SES group have more than 3 times lower opportunities than other students in the most successful group. In the period between 2003 and 2006, there was a substantial improvement in terms of the secondary effects of SES – in 2003, the most successful students with the lowest SES had almost 5 times lower opportunities, and in 2006, their opportunities were about 3.5 times lower.
- **"The school effect" (between-school variance),** i.e. the extent to which the student performance depends on the school the student is attending, in Serbia, is very high. Considerable variants between

schools were identified in the quality of education these schools are providing to the students. In mathematical literacy, the variance is above the OECD mean, and in reading literacy, the variance is at the level of the OECD mean, while in scientific literacy, it is below the OECD mean. A considerable portion of such variance is linked with the SES of the students attending these schools. Even though a considerable portion of these variances can be explained by the enrollment system in secondary education, the data confirms the existence of the secondary effects of socio-economic status on education in Serbia and the work of certain mechanisms "directing" the children from lower socio-economic groups towards schools with lower quality of education.

Based on the above findings, we can argue that the existing level of equity in education in Serbia, compared to the situation in other countries, is relatively acceptable. However, even if the equity level could be assessed as acceptable, that should not "mask" the fact that the level of education obtained by the poorest groups of students (after nine years of school) is exceptionally low. In addition, we need to reemphasize the evidence of the secondary effects of socio-economic status. The data suggests that a large number of poor children have a relatively small chance to break out of the "vicious cycle of poverty."

COST-BENEFIT ANALYSIS

Education systems in different countries function in very different conditions that can have significant implications for quality of education as well as for quality of educational performance of students. If in a certain country a higher portion of GDP is earmarked for education, this implies that education is given higher importance, that the education system would have more funds for development of quality of education (and not only for retaining status quo) etc. If teachers are better paid in a certain country, this may imply that the teaching profession is more respected, that there is a higher number of persons interested in this profession, that teaching staff is of higher quality and more motivated to work, etc. If teachers work in classes that are smaller than in other countries, this indicates that they are better positioned to apply active teaching models, that they can pay more attention to each student, that they can monitor advancement of each student in a better way and to stimulate their continuous improvement, etc. These and other similar characteristics of conditions in which schools and teachers operate should be borne in mind when analyzing educational performance of students in a certain country. In other words, in order to better understand data on quality and educational performance of students from Serbia at the PISA testing, they should be put in the context wherein the Serbian education system operates.

In this part of the report, results of Serbia in PISA 2006 testing will be examined from the perspective of two financial parameters (percentage of gross domestic product earmarked for education and level of teachers' salaries) and the average number of students that teachers in Serbia work with. The values used for these parameters are values for 2005, since that was the period directly preceding PISA 2006 study. Data for Serbia will be compared to the situation in other countries (selected as reference countries for this report). These analyses will help us ascertain to what level can the relatively low performances in Serbia be explained by conditions in which the education system in Serbia functions.

Investments into education and performance in the domain of scientific literacy

Table 12 presents data indicating the percentage of gross domestic product (GDP) earmarked for education in Serbia in 2005. The source of data used is the report "Financing and management of primary education in Serbia: findings and recommendations" developed for MPS (Levitas & Herczynski, of the Ministry of Education of the Republic of Serbia, 2006).

Table 12 Percentage of gross domestic product (GDP) earmarked for certain levels of education in Serbia (Levitas & Herczynski report, Ministry of Education of the Republic of Serbia, 2006).

	Republic budget		Local government		Total	
	In Dinars	% of GDP	In Dinars	% of GDP	In Dinars	% of GDP
2005 GDP = 1,628,500,000						
Preschool			6.949.931	0,43	6.949.931	0,43
Primary school	28.329.319	1,74	5.113.771	0,31	33.443.090	2,05
Secondary school	14.963.484	0,92	2.465.154	0,15	17.428.638	1,07
Student standard (dormitories)	927.317		2.213		929.530	
High education	11.611.381	0,71	55.375	0,003	11.666.756	0,72
Student standard (dormitories)	2.093.401		1.699		2.095.100	
Ministry of Education (+ sports and institutions)	1.248.059		6.925		1.254.984	
Total	59.172.961	3,63	14.595.068	0,90	73.768.029	4,53

According to the above report, Serbia invested some 4.53% of its gross domestic product (GDP) in education in 2005. On the other hand, the Budget Memorandum of the Ministry of Finance of the Republic of Serbia published in late 2008 states that the consolidated expenditures for education amounted some 3.5% GDP in 2005. This is a considerable disparity of data and it raises the question as to which of these two data reflects

the situation in Serbia better. In the ensuing analysis we shall use both information in parallel – the information from Levitas & Herczynski report shall be denoted as „Serbia 1“, and the information from the Budget Memorandum as „Serbia 2“.

Table 13 presents data on the percentage of GDP earmarked for education for Serbia and other reference countries from this report coupled with performance on the scale of scientific literacy that was in focus of the PISA 2006 study.

Table 13. Performance in the domain of scientific literacy and investments into education: Serbia and reference countries

Country	Scientific literacy	% GDP invested into education
EU (27states)		5.03
Bulgaria	434	4.51
Poland	498	5.47
Romania	418	3.48
Slovenia	519	5.83
Slovakia	488	3.85
Croatia	493	4.63
Norway	487	7.02
Finland	563	6.31
Serbia 1	436	4.53
Serbia 2		3.50

As evident from the information presented in Table 13, the EU countries earmark 5.03% GDP on the average, although differences among them are very big and range from 8.28% in Denmark and 6.97% in Sweden to 2.93% in Malta and 3.48% in Romania. Relative to these, earmarking in Serbia (irrespective of which estimate we use) is lower than the average earmarking at the level of EU countries.

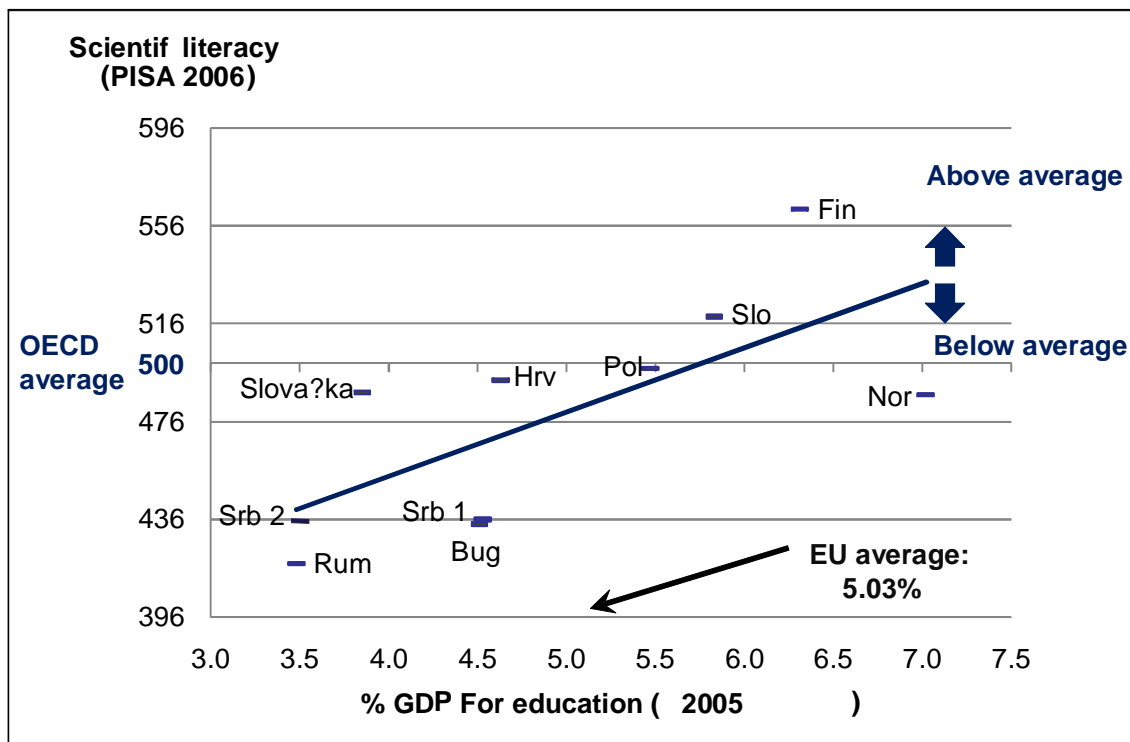
If Serbia earmarks some 4.5% GDP for education („Serbia 1“ in Table 13), then the investment in Serbia equals that of Bulgaria, and is by some 0.7-1.0 percentage points higher than in Slovakia and Romania. And if Serbia earmarks some 3.5% („Serbia 2“ in Table 13) then the investment of Serbia (and Romania) is the lowest relative to other countries included in this report. In both cases Croatia, Poland, Slovenia, Finland and Norway earmark a higher percentage of GDP for education than this is the case in Serbia.

In order to perform a more detailed analysis, we studied the ratio of investments into education and educational performance (see Figure 10). Figure 10 presents this ratio by a regression line. A statement can be made that the countries, above this line had somewhat better, and countries beneath it somewhat lower results than one could expect given their investments into education.

Analyzing the ratio between investments and educational performance, it becomes evident that the expected level of investments for attaining OECD average (500 points) amounts to some 5% GDP. Consequently, one conclusion may be that Serbia should increase the level of its investments into education if it wishes to reach the average level of educational performance of students from OECD member states. However, it should be highlighted that this increase of investments should not be „translated“ into the higher salaries of teachers only (see later analysis about teachers' salaries), but that additional funds must be invested primarily into raising incentives and improvement of the existing quality and equity of education in Serbia.

If the investment of Serbia into education is at the level of 4.5% GDP („Srb 1“ on Figure 10), then one may conclude that the educational performance of students in Serbia - at this level of investments into education – could be somewhat better. With this level of investments one would expect that the educational performance of students in Serbia be higher by approximately 30 points. However, if the investment of Serbia is at the level of some 3.5% GDP-a, then we could conclude that the educational performance of students in Serbia is at an approximate level one could expect in view of this level of investments into education.

Figure 10. Ratio of investments into education (percentage GDP invested into education, data for 2005) and educational performance of pupils on the scale of scientific literacy (PISA 2006)



In the context of this question, particular note should be taken to the case of Slovakia. Namely, Slovakia with a relatively low investment into education (approx, 1.2 percentage points lower than the EU average) has educational performance nearing the OECD average of 500 points (488 points). This information suggests high efficiency of the education system in Slovakia. Still, the picture alters to some extent if we take into account the fact that education system in Slovakia is significantly less fair than in the other countries. As already shown, the differences between students' performance depend on the socio-economic status of pupils in Slovakia (see more in the section about equity of education). This may mean that in Slovakia most of the savings are made on equity of education i.e. that many students from vulnerable groups do not receive the quality of education they would require in order to „catch up” with other students. Consequently, although the education system in Slovakia may, at first glance, appear efficient, the price paid through low equity must not be neglected as it can be a source of remarkable problems in the long run. For this reason, there are opinions that such high performance in Slovakia will be difficult to maintain for a long time with earmarkings below 5% GDP. The key argument at that is that with investments below 5% GDP, education mostly has resources for maintenance of the system and very few for development of quality and equity of education.

By way of conclusion, one could state that Serbia invests a smaller part of GDP into education relative to the EU average and that partly or almost entirely low performance in Serbia may be explained by these lower investments.

Salaries of teachers and performance in the domain of reading literacy

Teachers' salaries are a significant factor that may considerably influence quality and equity of education in a country. If teachers' salaries are low or if teachers are not paid according to their status, this may have a negative impact on the quality and equity of education in different ways. For instance, in the context of low salaries, the entire teaching profession may have low social status, teachers may be insufficiently motivated for quality work (particularly with the children in need of special attention), new generations may be less interested in teaching profession, etc. All this may have a negative impact on the quality and equity of education, and consequently, education will not promote development of functional literacy to the extent it would be possible.

For this reason, this report includes an analysis in which the information of educational performance of students from Serbia in PISA 2006 study are put into the context of teachers' salaries. In order to compare salaries of teachers from different countries, they have been expressed through percentage of GDP per capita in a given country. If net annual salary of a teacher is, for instance, EUR 3,000 and GDP per capita also EUR 3,000 then that would be 100% in the sense that teachers earn during a year the sum corresponding to GDP per capita in a given country. In other words, percentages lower than 100% suggest that teachers earn in a year less than GDP per capita in a country, or if the percentage is higher than 100%, this means that teachers' salaries exceed GDP per capita. The 2005 data for Serbia and reference countries were used for they best describe the situation in education at the time of conducting PISA 2006.

Table 14 presents information on ratio of annual salary of teachers working in primary and secondary education relative to GDP per capita for Serbia and reference countries included in this report. For some countries there are data on the salary range i.e. what is the ratio between minimum salary (teachers at the beginning of their career) and maximum salary (teachers at the end of their career). In that case we show the range of salaries. In case where we had information about the average salary only (Serbia and Croatia), only this information is indicated in the Table.

Table 14. Annual salary of teachers working in primary and secondary education expressed relative to GDP per capita

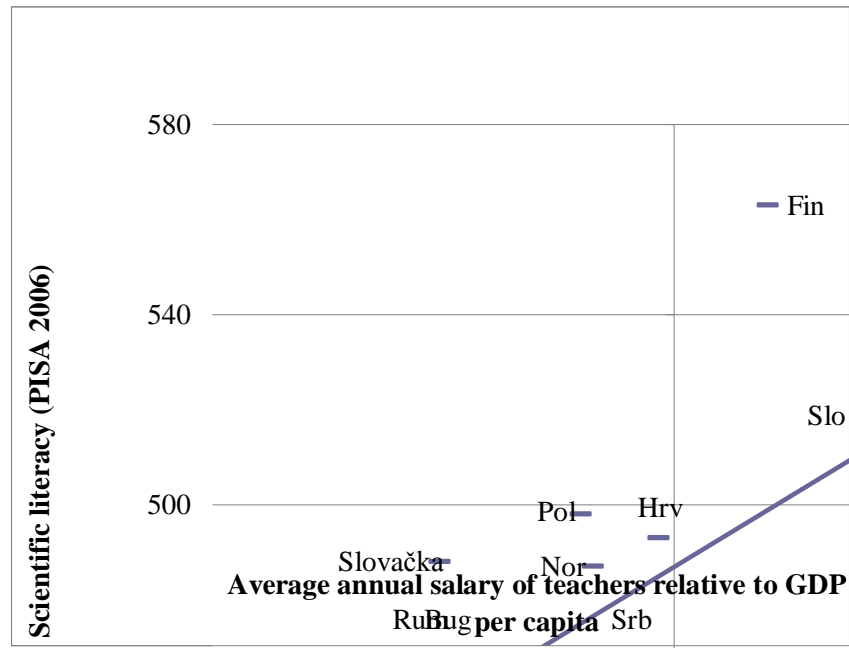
Country	Minimum salary	Maximum salary	Average
Serbia	--	--	89.43% *
Croatia	--	--	98.00% *
Finland	99.33 %	125.09 %	112.21%
Norway	79.91 %	98.97 %	89.44%
Poland	56.29 %	119.41 %	87.85%
Romania	57.26 %	85.07 %	71.17%
Slovakia	52.56 %	86.54 %	69.55%
Slovenia	120.13 %	202.55 %	161.34%
Bulgaria	59.85 %	89.34 %	74.60%

* Average annual salary of teachers relative to GDP per capita. Data on minimum and maximum salary unavailable.

Data suggest that the teaching profession, with the exceptions of Finland and Slovenia, is relatively poorly respected in Serbia and other countries included in this report. The annual salaries of teachers in Slovakia, Romania and Bulgaria totals approximately 70-75% GDP per capita; in Norway, Poland and Serbia is approximately 90% GDP per capita, in Croatia it is at GDP per capita level. Annual teachers' salaries are higher than GDP per capita only in Finland and Slovenia. In Slovenia, the minimum annual salary of teachers exceeds GDP per capita (some 120%), while the maximum annual salary reaches double GDP per capita value! On the other hand, these data suggest that Serbia is in the fourth place in the group of surveyed countries from the aspect of the amount of teachers' salaries (similar to Croatia, considerably lower than Slovenia and Finland).

Figure 11 relates teachers' salaries with the educational performance of students of the scale of scientific literacy (PISA 2006).

Figure 11. Ratio between average annual salary of teachers (expressed relative to GDP per capita) and scientific literacy (PISA 2006)



As seen from the data presented in Figure 11, the students from Slovakia, Poland, Norway, Croatia and Finland attain higher results than one could expect in view of teachers' salaries in these countries. The students from Romania, Bulgaria, Serbia and Slovenia attain somewhat lower results than one could expect. In this respect, performance of students in Finland are by approximately 60 score points higher than one could expect which suggests that quality and equity of education in Finland do not depend only on high salaries of teachers. In accordance with different reports, one of the relevant reasons for success of the education system in Finland lies in the high social status that the teaching profession enjoys in Finland, as well as in the fact that teaching faculties in Finland are attractive to many young people. Therefore, students who in previous schooling scored high enroll into these faculties. Slovakia is also a country whose students have high educational performance (scientific literacy, PISA 2006) than one could expect relative to the level of teachers' salaries. Still, bearing in mind that the average salary of a teacher in Slovakia is only some 70% GDP per capita, one could pose a question whether the low equity of education in Slovakia is the „price“ paid due to the fact that teachers are underpaid (for instance, in circumstances when poorly paid teachers may be insufficiently motivated to take care of their students and focus more on those students who are easier to work with). Whatsmore, will Slovakia be able to maintain the current level of students' educational performance in the long run is also questionable.

Serbia, with Bulgaria, Romania and Slovenia is located below the regression line which suggests that performance of our students in the domain of scientific literacy (PISA 2006) was somewhat lower than one could expect relative to the salaries of teachers. On the basis of these data a conclusion could be drawn that educational performance of students from Serbia could be higher by approximately 40 score points and keeping the current level of teachers' salaries.

Student - teacher ratio and performance in the domain of scientific literacy

The student – teacher ratio is the following indicator that contributes to understanding the efficiency of a given education system. This indicator describes the conditions a teacher works in. A large number of students per teacher restricts, to certain extent, the teacher in using the active models of teaching and learning and to monitor and support each student, etc. Table 15 shows data on the average number of students per teacher in Serbia and other reference countries included in this report in 2005. The given value for Serbia is the estimate made on the basis of data obtained from the Republic Statistical Office.⁴

Table 15. Pupil-teacher ratio (primary education, 2005)

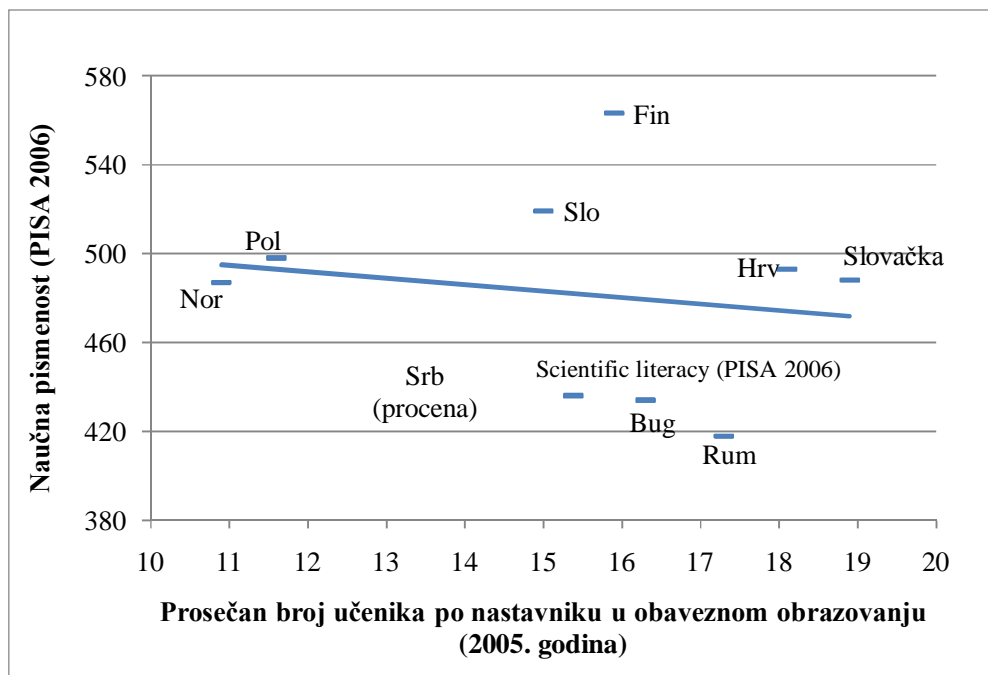
Country	2005
Bulgaria	16.3
Poland	11.6
Romania	17.3
Slovenia	15.0
Slovakia	18.9
Finland	15.9
Croatia	18.1
Norway	10.9*
Serbia (estimate)	15.4
Average	15.5

*Data for 2006

Evidently, the number of students per teacher in Serbia 2005 was at the average level for this group of countries. Therefore, one may say that in Serbia the number of teachers relative to the number of students is proportionate to that of the other countries. However, it needs to be stressed that Poland, that registered continuous growth in educational performance of students in all the three PISA studies (2000, 2003 and 2006), has had a gradual decline of the number of students per teacher from 15.21 since 1998 (1998, source: World Developmental Indicator database) to 11.6 in 2005. This fact may be one of the explanations for the increasing educational performance of students in Poland.

Figure 12 presents data about the ratio between the average number of students per teacher and educational performance of students in the domain of scientific literacy at PISA 2006 testing.

⁴ According to the RSO data, there were 639,293 students in regular primary schools and 46,353 teachers in Serbia 2005. Of this number, 36,769 teachers were employed full time, while 9,584 teachers worked less than full time. As the RSO does not have information on the degree of engagement of teachers who are not working full time, it cannot publish an official information on the number of teachers as it is done in the other EU countries i.e. in full time equivalent terms. For instance, if 1,000 teachers have 11 classes a week, and the norm is 22 classes/week, then each individual teacher would be working 50% of working time and this would be expressed as 500 FTE teachers. In order to establish FTE number of teachers in primary schools in Serbia in 2005 that would allow comparison with other countries, we assume that 9,584 teachers (who were not working full time) was engaged 50% of working time on the average. And thus the calculated FTE number of teachers in Serbia is 41,561 (36,769 + 9,584/2). Consequently, 639,293 students were taught by 41,561 FTE teachers in Serbia in 2006, which means that there were some 15.4 students per teacher in that school year.

Figure 12 Ratio between average number of pupils per teacher and scientific literacy (PISA 2006)

On the basis of data presented on Figure 12, it is evident that the expected performance are on continuous decline with an increase of the number of students per teacher. Furthermore, it is obvious that the education system in Finland is very efficient in this respect, for with a relatively high student – teacher ratio, it manages to secure high educational performance and of all students (bearing in mind the information presented in the equity analysis that equity in Finland is at the highest level). Analyzing the position of Serbia, one may conclude that educational performance could be higher even with the current student – teacher ratio.

Cost-benefit analysis: conclusion

Cost-benefit analysis in Serbia shows that the total investment into education in Serbia is lower relative to the average percentage of GDP that EU countries invest into education. Furthermore, one can justly assume that, in order for the average educational performance of our students to reach the OECD levels, most probably the percentage of GDP invested into education should be increased up to the level of some 5% GDP. Realistic projections are exceptionally important for this increase so as to make it achievable. Based on the experience of Slovenia⁵ one could state that increase at a rate of 0.1 percentage points/annum would be the most realistic.

Increased investments do not mean only more funds for education, but would also give a strong practical signal of education being a significant priority for Serbia. The authors of this report believe that education was not even declaratorily mentioned as a priority in the previous period which might have resulted in the lower motivation of the entire education system. This reduced motivation in circumstances when the entire sector is somewhat marginalized and neglected, could bring about a situation when this system in Serbia does not provide the level of quality and equity of education attainable in realistic circumstances. The above presented data suggest that the educational performance of students could be higher even in the existing circumstances (specially when taking into account the level of salaries of teachers and the average number of students per teacher).

Nevertheless, with the current level of investment and limited funds allocated to developmental activities in education in the budget (according to some estimates, some 95% budget is spent on salaries) one can hardly expect a more substantial improvement of quality and equity of education. That is why the increased investments

⁵ Personal communication with Slavko Gaber, former Minister of Education of Slovenia.

into education should not „spill“ into higher teacher salaries only. These additional funds should be spent very carefully. And that is why, in parallel with the increase of investments for education, control, efficiency and transparency of spending must be improved in order to secure that these additional investments translate into higher quality and equity of education. In other words, the sheer increase of funds will not necessarily result in increase of quality and equity of education and that is why various mechanisms should be put in place to ensure advancement of quality and equity.

In this context the current system of monitoring quality and equity of education system must be advanced as it is currently not fully functional. This system should ensure identification of those parts of education system that guarantee higher quality and equity of education (bearing in mind the circumstances in which they function), as well as those parts of the educational system that could function in a better way. The former require an awards system (symbolic and material), and the latter a support system that would assist them in improving the quality and equity of education.

SYSTEMIC SOLUTIONS IN EDUCATION SUPPORTIVE OF HIGH EDUCATIONAL PERFORMANCE: EXPERIENCES OF OTHER COUNTRIES AND MEASURES OF EDUCATION POLICY IN SERBIA

This chapter provides an overview of the strategic solutions and activities of certain education systems which keep scoring high on PISA testing. The main reason for it is to describe educational environments supportive of high educational performance (as defined by the PISA study) in order to take note of these, possible and already tested experiences when defining education policies in Serbia. The solution and measures that will be presented here are a result of comparative analyses of data collected in different countries. However, it should be borne in mind that the described solutions and activities form a context conducive to „growing“ or advancing educational performance in a country and even though we do not know the extent to which each of these elements contributes to educational performance nor how efficient they would be implemented in another education system. Solutions and measures discussed here do not represent recommendations and cannot be adopted without additional analyses: of applicability, prediction of impact on performance, etc.

Herein we compare the key characteristics of education systems traditionally successful in PISA study. Effort has been made to identify systemic solutions common for all of them. These were compared with the planned activities of education policy in Serbia in the previous period (2004–2008), to the extent made possible by nature of data, so that we would acquire a picture on how much and in which areas is the education policy in Serbia similar or different from education policies in OECD countries.

Characteristics of education systems successful in PISA study and measures of education policy in Serbia

For identification of factors influencing educational performance, we thought particularly relevant the experiences of the countries who were marked as successful in PISA study i.e. the countries with a registered set of results as follows: (a) high and stable average performance, (b) homogenous performance (minor differences among certain groups of students) and (c) low correlation of performance with the index of socio-economic status. On the basis of these three criteria, the education systems of Finland, Canada, Australia, Hong Kong, Holland, Macao and Korea were identified as successful. Their characteristics are grouped relative to the aspect of education system they refer to. The following sets of characteristics were identified: education system management, structure of education, quality of educational performance and professional development of teachers.

In parallel we present strategic activities to be implemented in the Serbian education system since 2004. These are activities stipulated by national strategies adopted by the Government of the Republic of Serbia during this period.

Box 3.

On planned strategic activities in the education system in Serbia

For the purpose of the present analysis 207 individual activities were identified which are part of inter-sectoral strategies of the Republic of Serbia adopted by the Government since 2004 and to date. All the limitations that prevented us from speaking about the efficiency of applied activities should be borne in mind: 1) absence of direct data as to whether the implementation actually took place, whether the timeframe was observed, and specially if we do not dispose of the data on impact evaluation, 2) the classification, even enumeration of the implemented activities is not an easy job as they differ from the aspect of the level of generality and complexity. Consequently, there are activities involving a set of individual solutions, so this raises the question of whether it is one or several activities we are dealing with. Some activities are formulated in the most general way, so a distinction between a concrete activity and its objective is impossible to make (e.g. increasing capture of children with primary education), 3) certain activities appear to be identical from the aspect of content, meaning and even formulation, but they are implemented within the framework of different action plans of distinct strategies, and therefore represent mutually independent activities.

In view of these limitations, the text will provide only an overview of analyzed activities and assessments to the extent that they are aligned with trends in education identified in education systems of the observed countries.

Managing education system

The education systems successful on PISA testing display the below, typical solutions:

1. Decentralized decision-making process, high level of autonomy at regional and individual school levels. Local community is the most relevant strategic partner participating in planning and implementation of everyday school life – starting with implementation of teaching activities to performance evaluation .
2. Defined curricula, educational standards and objectives, at national and/or regional level, but not strictly defined methodology. The teacher is free to decide on methodology, time spent on certain areas, method of testing the knowledge about the covered teaching material, whereby the key planning criteria is whether the students adopted it as defined by the current education standards. In many countries with high performance, the focus in education management has been shifted from resource control to performance management.
3. Direct link between education and labor market, requirements of the labor market defining the offer of educational profiles.

Of the series of activities planned for education in Serbia, this group includes activities that refer to durable solutions in education system (endorsement of strategic documents, laws, legal acts and regulations), as well as positioning of education in the national budget. A total of 15 activities are included in this category.

Annual reports of the Ministry of Education show that the Government adopted 10 legal acts pertaining to education during 2007 only, while during the same year the state government authorities adopted 70 regulations. However, neither these laws nor the regulations adopted bear strategic significance. Rather, they regulate certain concrete, current issues (e.g. enrollment quota), with the exception of a series of Rulebooks on type of education of teachers in vocational schools.

With respect to advancement of material standards in which schools operate, the activities provide increase of the share of education in the budget at a rate of 0.4% /annum in the period 2005–2011. The comparative data from different education systems show that ratio between investments into education and educational performance is not linear and that higher investments do not guarantee better educational performance, but that the increase of investments into education always results in added value reflected in taking the viewpoint that the state finds education important and perceives it as a value worth investing in. The change of perceptions about the status of education in the society is the factor that can indirectly contribute to harboring education as a value and increase of students' performance. Already three cycles of PISA survey prove more than modest links between students' performance and factors such as school resources, school policies and institutional characteristics.

The real problem are activities that should have appeared in this category, but are absent therefrom. These are all the activities referring to the system decentralization and increasing of autonomy of local school administrations, certain schools and teachers as had been planned by the education reform the implementation of which began in 2001.

Structure of education system

Analyzing the practice of countries traditionally successful on PISA testing from the aspect of education system organization, we may identify the following solutions or tendencies in (re)organization of education:

1. There is a tendency of extending the length of primary education.
2. A large capture of children by education system has been achieved (in most of the countries of Western Europe and North America this capture is full). Increasingly, the countries introduce mandatory secondary school education.
3. The trend is that children with special needs are streamlined into regular classes in regular schools where they are provided with individual tuition and peer support.
4. Grouping of children as per their capabilities and inclinations (institutional differentiation) is introduced as late as possible in education. Schools and teachers have explicit strategies and approach to work with heterogeneous groups of students; high level of the learning process individualization is achieved; compensatory curricula developed for students living in disadvantageous socio-economic circumstances.

5. Language catch-up classes are organized for students for whom the language of teaching is not the mother tongue.

6. Equality in distribution of educational opportunities is an explicit strategic objective that may be implemented by various programs some of which may be realized at the level of regions or individual schools.

7. The students are offered a series of extra-curricular activities.

With a view to activities the implementation of which is planned in Serbia, these refer to improvement of quality of education at different levels: from preschool to university education, as well as specific measures contributing to an increased access to education and capture of children by schools, particularly children from vulnerable groups.

The conclusion that the majority of planned measures are in this category (75% of all the planned measures) was expected. Notably, there is a big disbalance between the number of measures targeting certain levels of education. And so, the measures targeting preschool education are numerous, as it became mandatory for children aged 6. Although measures referring to the segment of education originate from different strategies, they are not contradictory (but there exist overlaps) and mostly cover all the aspects contributing to the quality of preschool education. The measures targeting primary and general secondary education (gymnasiums) are almost non-existent, while all the other levels of education have been covered. A particularly good synchronization of measures was made with those providing for reorganization of the system of vocational education and linking it to the labor market requirements.

The majority of measures refer to schooling of Roma children. Driven by the Roma Decade and the Millennium Development Goals, this group of measures is larger than any other. As with preschool education, it may be stated that the activities planned therein cover all the relevant aspects of education of this group of young people. Still, a large number of activities in this group deals with establishment of an independent system of monitoring and evaluation of Roma education instead of integrating this system into the existing. Also, the inclusive character of this education system would be significantly improved had the positive measures systematically „covered“ all the vulnerable categories (e.g. poor children, specially from rural areas; IDP and refugee children), as well as all the education levels. Potential danger of the absence of systematism in development of measures are that inclusion, and increase of capture of children by school represent the objectives implemented within the Roma Decade so they might also finish with it.

Absence of measures regulating capture of students enrolling into certain types of schools, the criteria and timeframe of selection/grouping of students, number and capture of specific education profiles, extracurricular activities is notable... Serbia is one of the first countries where the majority of secondary school students (almost 76%) is captured by vocational education (situation similar in Holland, Slovenia, Montenegro), but there are countries where the period of general and mandatory education has been extended to secondary level. Data of PISA survey show that in OECD member states, the number of schools and different types of education curricula available to 15-year olds is not related to average performance, but that 52% of the obtained differences may be explained by differences among schools (i.e. type of school is irrelevant; some schools are simply better than others!). Also, in countries with a variety of types of schools and curricula, socio-economic status has a strong influence of students' performance. To put it concisely, the socio-economic status of secondary school students in Serbia is expected to significantly determine their educational path and attainment (as confirmed by the analysis of PISA data). Special measures should provide for equal distribution of educational opportunities.

Advancing the quality of educational performance

OECD data show that special attention in successful education systems (successful in PISA survey) is paid to the issues of standardization in education and thus standardization of educational performance while the external grading is an instrument which is used, at the system level, to control realization of the adopted education standards. A comparative analysis of these systems shows the below common solutions:

1. In parallel with educational standards, a system of external performance evaluation is developed. The practice of the majority of countries is that external evaluations are mandatory at the end of each school year or educational cycle. Also, a lot of attention is paid to school self-evaluation.

2. The evaluation of students' performance is focused on processes and/or the results of centralized examinations are combined with individual reports on students' advancement. The marks obtained at these examinations represent one of the elements of the final grade.

Serbia has planned a relatively small number of measures focusing on this segment of education. In addition, the measures relating to increase of efficiency of education and monitoring performance are highly generalized measures, so the issue appears of how they are implemented in practice. The measures targeting development of curricula, textbooks and didactic materials refer only to the population of Roma students.

At the same time, some characteristics of education system crucial for improving the quality of educational performance, have been totally forgotten. No measures support the process of development and adoption of education standards, Neither the external performance evaluation system, nor system of evaluations in education have been established.

Professional development of teachers

In efficient education systems:

1. Teachers for all levels of education attend faculties for teachers, usually inter-disciplinary.
2. An integral part of the education of teachers is their continuous and mandatory professional development.
3. Some professional development programs are mandatory. There usually exists a number of hours of professional development that a teacher needs to take in the course of a school year. A part of the total number of hours of professional development is mandatory.
4. Particular attention is paid to professional development of principals. In countries where that is the case, the principals are no longer recruited from among school teachers but are educated at special faculties. It is recognized that managing a school requires a different set of competencies than that possessed by teachers.

Measures to be implemented in Serbia relative to professional development of teachers have been categorized into: training of teachers and development of human resources working with Roma children.

Almost all the planned measures from this category have been designed so as to respond to current requirements and are not systemic. Also, not a single measure refers to basic education of teachers but only to „in service“ trainings. There is no professional capacity building of principals who were not essentially educated for managerial work in education. An only exception is the measure stipulating evaluation of the quality of training of teachers.

Systemic solutions in education supportive of high educational performance and measures of education policy in Serbia: conclusion

Distinctive characteristics of similar education systems successful on PISA testings could briefly be described as efforts to ensure equal educational opportunities to all the students, and primarily opportunities to attain the expected quality of education outcomes. The ultimate objective is full capture of children by general education and inclusion of all categories of children with special educational needs with a system thus oriented, and with teachers trained to support students as individuals.

On the other hand, measures planned over the previous five-year period in Serbia, correspond to the trends identified in education of certain successful countries. However, these are independent measures lacking strategic framework and underlying basic directions of development of the education system. Serbia still lacks a National Education Development Strategy and the measures stipulated it be agreed upon and endorsed in the period 2007 - 2009. We hope this document will be produced within the planned timeframe, as it is a key step securing harmonization and multiplication of impacts of individual measures. It is only upon defining and endorsement of the National Education Development Strategy can we speak about systemic development of education. The individual measures are incidental only, and do not describe the situation or policies. However, this Strategy must take note of the current situation and link all the individual initiatives as well as provide for all those that are still lacking. Therefore, the most important recommendation would be adoption of a National Education Development Strategy as it would secure controlled and projected development of the education system in Serbia.

Typically, the ongoing activities are but an immediate response to the existing requirements or international trends. Consequently, the highly generalized objectives of education are implemented partially and without control, and not systematically and in a planned way through implementation of lower-level generalization activities instead of *vice versa* - that the overriding objective generate specific and concrete measures. The danger of such events in educational policy is that some more general objectives (capture, accessibility of schooling and social inclusion) be linked for Roma Decade only and implemented through measures tailor made for this population and not to become permanently implemented independent objectives.

The only comprehensive measures are those related to education of Roma children (provide for all the relevant aspects of education), so it may be stated that there is a comprehensive plan for Roma education. However, the extent to which it is implemented is questionable. Measures targeting other vulnerable groups are sporadic and fragmented.

HOW TO IMPROVE THE QUALITY OF EDUCATIONAL PERFORMANCE IN SERBIA: RECOMMENDATIONS

The afore analyses describe the current quality and equity of education in Serbia and identify the aspects of education system that call for improvement that would result in improved performance. The key objective of the below recommendations is to formulate proposals (short-term and mid-term) potentially leading to advancement of quality and equity of education in Serbia. Although formulated and explained as independent proposals, it is clear that should they be implemented, their effect would be stronger and most likely only possible if they were systemic and harmonized.

We will first list short-term measures directed at preparations for PISA 2009 survey to be implemented in April - May 2009 with students aged 15 (the majority attends the first form of secondary schools). Their aim and purpose is to provide a more reliable and valid picture of quality and equity of education, and not to improve these as this cannot be done in a matter of a few months and through *ad hoc* implementation. The majority of recommendations that will follow short-term measures will refer to **systemic measures** (that should result in establishment of an integrated educational system, efficiently run and continuously improved) and **specific measures** (referring to provision of particular support to vulnerable students in the domain of reading literacy where educational performance is considerably lower relative to mathematical and scientific literacy).

Short-term measures directed at PISA 2009

As part of preparations for participation of our students at PISA 2009 testing, the Ministry of Education should print and distribute to all the schools, an overview of the structure of educational competencies surveyed, including description of the level of difficulty. This overview would ideally be illustrated by a number of assignments that appeared in previous cycles of PISA survey that we can describe with performance of our students: how they responded, how difficult each of them was, what were the typical mistakes ... This would ensure that students, teachers and the public in Serbia learn about the type of assignments used in PISA testing. On the one hand, it would reduce the possibility that students, due to lack of experience with PISA type assignments, score lower. At the same time it would enable teachers and schools to inform themselves of the modern concept of functional literacy. This experience could have long-term positive consequences reflected in use of this model in teaching and grading.

Just before the testing takes place, the Ministry of Education should „take the lead“ and publicly announce conduct of PISA testing in a given period, stress and explain the relevance of the testing. It should also explain that the data obtained will be used as guidelines for improvement of the current quality and equity of education and not for pointing a finger to the culprit and accusing schools and teachers. All of this could raise motivation of teachers and students to give their best and therefore, secure a more realistic picture of the quality and equity of education in Serbia.

Finally, in spring 2010 the Ministry should start preparations to publish the results of PISA 2009 testing cycle. The preparations should include organizing seminars for the officials of the Ministry engaged in tasks that are directly affected by PISA results. Similar seminars could be organized for the media in order to enable them to gain understanding of the meaning and purpose of PISA testing and ensure, as much as possible, that they present results in a way that would prompt public debate on the significance of education, quality and equity of education in Serbia, and the ways to improve it. Seminars for the media are very important for they could prevent sensationalistic writing about PISA results and creation of non-constructive, negative atmosphere surrounding education system. Quite the contrary, they could contribute to promotion of education as a value and increasing the level of sensitivity and interest of public for education-related issues.

Starting from the assumption that the results of PISA study represent a relevant indicator for monitoring quality and equity of education in Serbia, the PISA 2009 or a subsequent cycle of testing should involve also the sample of 8th form students of primary schools. Namely, the existing data provide for identification of differences among different secondary schools and different educational profiles of secondary education, but not of differences between different primary schools (although the influence of the latter is paramount to the performance of students in the 1st year of secondary schools). By involving the students of the 8th form of primary schools into PISA survey, one could obtain data related to primary schools. Therefore, it would be possible to identify schools who manage, in the current conditions to ensure quality of education stimulating development of higher competencies tested by PISA survey. Analyzing the data for primary schools that support development of

functional literacy more than others would help ascertain the characteristics of schools (organization, management, atmosphere, methodology of teaching, relationship between teachers and students, cooperation with local community and parents, etc.) linked to a higher quality education. These information would suggest the quality already existing in some primary schools and how they manage to ensure it for their students. These successful models could be further promoted and replicated. The main advantage of this approach is that it is founded on several assumptions: that high quality schools do exist in the current circumstances (but are invisible at the moment), that some schools have found a way to ensure that they be a high quality school in our education system and that it would be more realistic that these models, that emerged in the schools here, be adopted and adapted by others rather than others that emerged in foreign countries. In addition, this approach would promote a „positive atmosphere“ since the emphasis is placed on schools that are already of good quality and not others faced with problems.

A direct benefit to the quality of teaching, that would surely reflect on the quality of educational outcomes, would be generated by programs of professional development of teachers focusing on reading literacy. Currently, of all PISA competencies, development of reading literacy is the least supported by curricula, where traditional concept of literacy as a process of acquiring basic literacy prevails, so teaching is actively engaged in mastering reading skills in the first two forms of primary schools only. In the course of later schooling, reading is considered understanding and interpretation of literature and upbringing in the spirit of aesthetic values. It would be reasonable to familiarize teachers with the modern concepts of reading literacy and demonstrate the ways in which they can stimulate different reading skills. Logically, the seminar would target teachers teaching languages (mother tongue and foreign languages), but it could involve all the teachers for reading literacy can be developed in all subjects.

Systemic measures

Increasing investments in education

The level of investments into education in Serbia is below EU average. Furthermore, most of the budget for education (even more than 95% according to some estimates) is spent on salaries of employees. In such circumstances one cannot expect a substantial and sustainable progress of quality and equity of education. Consequently, gradual and constant increase of investments into education are called for in order to attain the level of approximately 5% GDP. This increase should be realistically planned in order to ensure its sustainability.

An increase in allocations for education does not automatically bring about improvement of quality and equity of education. Still, the increase of investments into education creates a climate conducive to development of education by giving it a stronger strategic significance, promoting it as a social value and instrument of overall prosperity of the society e.g. its technological and economic progress. However, this increase should not only „translate“ into higher salaries of the teaching staff. Utmost caution must be exercised in spending these additional funds. Therefore, in parallel with increase of investments into education, control, efficiency and transparency of spending must be improved in order for this additional investments to translate into a higher quality and equity of education. In other words, the very increase of allocations for education will not necessarily and automatically result in advancement of quality and equity and that is why different mechanisms are required that will secure that quality and equity are advanced as a direct result of additional investments.

In this context, the current system of monitoring quality and equity of functioning of education system, which is not fully operational at the moment, should be improved within the educational system.

Development and adoption of National Education Development Strategy

The key guarantee of harmonized and planned development of education system and the continuous systemic advancement of its efficiency is development of a National Education Development Strategy. In drafting the Strategy it would be of crucial importance to ensure **consensus of all political parties** about the key elements of thereof and thus secure continuity of implementation in changing political settings. The National Strategy is an **inter-sectoral document** developed and adopted **transparently with secured participation and support of all relevant stakeholders** (teachers, students, principals of schools, school assistants, parents, etc.).

An integral part thereof is a pre-established system of monitoring the implementation of strategic activities and timeframes. The existence of the system entails predefined and prealigned criteria of impact

assessment, securing feedback to the designers of educational policy from the aspect of measures and creates conditions for adjustment of the projected activities in line with their realistic performances. Certainly, the system of criteria also presupposes definition of general indicators of development of education system and the indicators of quality of educational performance. The current strategic documents of many countries and also those in our immediate neighborhood (e.g. Croatia) show that the results of PISA test are the most frequently used indicator of quality of education.

Development of indicators for permanent, systematic monitoring of education system

In order to establish the system of monitoring the situation in education, the set of indicators considered relevant thereto must be agreed upon. The set of indicators should fulfill the following conditions: to be comprehensive, to contain the least possible number of indicators, availability of relevant and valid data to feed into the indicators, that the indicators be recognized as relevant by both the expert community and institutions in charge of monitoring the situation in education and developing educational policy, that they provide for public reporting on the situation in education.

The above mentioned set of indicators should certainly involve indicators providing monitoring of educational performance of students. One should bear in mind that one of the utmost objectives of educational policies and measures is that educational performance of students be as high as possible (the quality of education) and that differences between the students (irrespective of implicit differences) in educational performances be the least possible (equity of education). In addition to the indicators, particular groups of students considered vulnerable from the aspect of ensuring quality education (e.g. poor, refugee and IDP children, Roma children, children with developmental problems, etc.) whose educational performance need to be specially monitored, due to the requirement to monitor equity of education. In other words, certain indicators should be reported against not only at the national level (at the level of the entire student population), but also at the level of particular subgroups.

In this context, it should be highlighted that there are already indicators at EU level agreed upon and accepted as relevant for monitoring the implementation of Lisbon Agenda in education. Each country – EU member – has the obligation to report against these indicators on the situation in the education sector. In view of the process of EU integration, Serbia should consider the possibility of aligning the future set of indicators with the existing EU indicators. This would consideration of educational system in Serbia from the EU perspective which is very relevant for the current students as they will spend most of their lives as EU citizens. Furthermore, alignment with EU indicators would secure sustainability of the given system of indicators as it would not require changing at the time of Serbia acceding into EU.

Developing standards of educational performance for mandatory education

We are AGAINST developing special standards for each subject in each form although this would be in line with the existing organization of the education system (curricula developed in independent procedures for certain subjects and certain forms). This approach would support the existing weak horizontal and vertical linkage of curricula. Defining two types of standards would help overcome the present fragmentation of curricula and also educational outcomes: *subject standards*, that would describe knowledge and skills specific for that subject (dominantly developed due to specifics of a given subject) and *general standards* that would include knowledge and skills (or competencies) developed through interaction of content of different subjects (example of such knowledge and skills could be those tested within PISA studies). The standards would be developed for finalization of mandatory education and they would represent some kind of a „contract“ between the education system and the society and parents as it would define knowledge and skills the development of which is guaranteed in mandatory education.

In the course of development of standards, they should include all those competencies recognized at EU level as relevant and significant for young people in order to „equip“ them for a life in a modern social, economic and cultural environment. Although not yet part of EU, the children educated by these standards will be the citizens of EU. Therefore, it is important that these standards respond to the requirements and challenges they will be facing and the environment they will be living in.

In addition to standards related to expectations about the end of mandatory education, it would be good to develop the standards defining expectations related to knowledge and skills that students would develop by

certain form. These would serve for monitoring progress of students during mandatory education and could be termed „standards of progress“. These „standards of progress“ would enable schools, teachers and parents to monitor advancement of students, to plan future work with students who have not mastered the expected standards, and to secure better understanding between students, teachers and parents relative to criteria of marking.

All the different standards mentioned here should be part of a coherent and integrated system of standards. The standards of progress would derive from standards of mandatory education and, therefore, may be developed by experts.

Harmonization of curricula, textbooks and other didactic materials with the standards of educational performance

The existing curricula are mainly reduced to citing content and topics that need to be covered during a school year. Many relevant factors making the quality of teaching appropriate and regulating it have been neglected: efforts to link the materials within one subject with another and/or everyday experiences of students are very infrequent; expected competencies and expected levels of performance have not been explicitly stated; curricula are uniform, making no distinction among pupils with different educational requirements (prior knowledge, interests, motivation). Practically, the standards of educational performance are defined by teachers themselves depending on their personal assessments and expectations. Furthermore, the current curricula are insufficiently precise a guide to the authors of textbooks from the aspect of the expected levels of knowledge (competencies), but only from the aspect of content (themes) that need to be covered.

Advancement of the national system of monitoring and assessment of educational performance

Educational performance of students, within the mandatory education in Serbia, are assessed through nation-wide testings (sample of students in order to obtain data for development of educational policy) and nation-wide examinations. With reference to examinations, there is currently a qualification examination taken at the end of primary school used for selection of students to enroll into secondary schools. In accordance with the law, qualification examinations will be mandatory for entry into secondary schools until 2011 when the current pupils of 6th form of primary school finish 8th form of primary school. These will be replaced by a final examination that will have a two-fold function: to verify whether the student attained a certain level of educational performance considered sufficient to be issued a diploma on completed mandatory education, and as a selection for entry into secondary schools.

Also, it should be highlighted that the current qualification examination serves as one of the significant drivers of low educational performance of our students. The main downside thereof lies in the fact that it is comprised of familiar assignments. The negative implication of this solution are: students are stimulated to learn the assignments by heart, a very wrong message is sent to them as to what are knowledge and learning, how to study and what it means to know something; the students who learn assignments by heart may attain high results at qualification examinations just as other students who truly understand what they were thought. There are indications that there have been instances of copying and assisting students at qualification examinations, even of the so called „privileged“ forms were students who are being assisted take this examination. If true and if the volume is not neglectable, it could strongly impact students in developing an idea that it is much more important in life whom you know, than what you know, that „connections“ and „corruption“ are desirable, that the society and its institutions do not take equal care about everyone, but only about the privileged and other convictions that will significantly hinder development of democracy, rule of law and fight against corruption in Serbia. Furthermore, the non-standard examination situation (copying, talking and noise) distress most the students who have prepared for the examination solidly and with understanding and reduce their performance and consequently, competitiveness relative to desired secondary schools. Instead of awarding knowledge, they award copying and/or learning by heart final solutions.

Since the qualification exam will be in force only until 2011, it should not be revoked but used and modified so as to ensure gradual transition to system of final examinations. Furthermore, it should be ensured that the final examination does not include familiar assignments as is the case with the qualification examination. For

the time being, there is no publicly announced concept of final examinations which means it can be conceptualized differently. Still, one may assume that the later the work on it starts, the greater possibility it would resemble the qualification examination. Consequently, one should use this legally provided transition from qualification to final examinations and modify the former as a tool of gradual transition and ensure that the final examinations be such as to stimulate development of higher level of educational performance and not learning concrete assignments, facts by heart.

In the context of development of the concept of final examinations, one may formulated certain suggestions in order for it them to become „leverage“ for improvement of the quality of education in Serbia. First, as already stated, final examinations should include unfamiliar assignments. Second, although this goes without saying, it must be highlighted that final examinations should be organized in equal conditions for all students and to render that the knowledge of student is decisive for his success. Third, the preparation for final examinations should take the form of publications to inform the students not of concrete assignments but of the description of knowledge and skills required that will be based on standards of educational performance, examples of assignments, explanations as to how to think and explanations of the grading system. Fourth, the schools and students alike should be provided with workbooks and examples of tests similar to those that they would be presented with at the final examinations so that they would be able to practice and monitor their progress in preparing for them. If the future final examination was to fulfill all the above conditions, it would serve as a „leverage“ for improvement of the quality of teaching and learning in schools and of educational performance of students. In addition, such a final exam would produce a wealth of information giving significant insight into the quality of education, identification of "strengths and weaknesses" of the education system and development of education policy.

On the other hand, the system of national testing should be linked to „standards of progress“ i.e. to secure information about the progress of students in the course of mandatory education that would be useful for identification of regions and schools where students to not meet the expected standards of progress; of the groups of students who require additional support in order to be able to progress towards the standards expected at the end of mandatory education and other information useful for development of educational policy.

Standardization and improvement of the quality of marking

School marking has a significant role in the current educational practice. It suffices to highlight the fact that school marks constitute 60% of the total number of points for entry into four-year secondary schools i.e. 100% in case of students enrolling for three-year secondary schooling, as well as 60% of the total number of points for enrollment into the majority of faculties. However, the marking criteria among teachers vary significantly. Analyzing school marks and their correlation to the performance of students at qualification examinations, enormous differences in the level of knowledge that students must have in order to get a certain mark in school are noted. Not infrequently the student has a much higher level of knowledge than another student of a different school or with a different teacher, but his mark is still significantly lower. In view of the significance of school marks at the stage of enrollment into secondary schools and faculties, this means that the students who now a lot but have lower marks (having studied in schools or with teachers with very high criteria), are in a particularly worse off position.

The problem with different marking criteria cannot be resolved without developed standards of students' performance as well as progress standards. The teachers need rulebooks for grading as well as databases of assignments and tests that would ascertain whether the students (and to which extent) have managed to attain the expected standards for their particular level of mandatory education and in order to assess whether the progress they have made is in line with the standards for completion of mandatory schooling.

Monitoring and implementation of positive experiences of other educational systems

Although the education system is created and managed within a country, there exists a phenomenon that we might name „international culture of education“ the influence of which has been evident and pervasive over the past 50 years. This phenomenon brings about considerable similarities among the education systems of different countries, particularly at the level of base education where there is a high level of consensus about the objectives

of education related to language, mathematics and natural sciences. The international culture of education relies on modern economy and common international culture, technology development, specially in the domain of telecommunications that contributed to almost momentary exchange of information in the world and an enormous number of beneficiaries simultaneously involved in this exchange, and increased social mobility. In this way, each education system should be a result of simultaneous and mutual action of national and international processes and influences.

For the purpose of this analysis, we have highlighted only the most general trends common for the education systems traditionally successful in PISA testing, as well as the trends and objectives included of the European documents which may be summarized through the following recommendations: there is a tendency of extending the duration of primary education; a large capture of children by education system has been achieved (in most of the countries of western Europe and North America this capture is full); children with special needs are streamlined into regular schooling; grouping of children as per their capabilities and inclinations (institutional differentiation) is introduced as late as possible in education; schools and teachers have explicit strategies and approaches to work with heterogeneous groups of students; a high level of individualization of the learning process is in place; compensatory programs have been developed for students living in unfavorable socio-economic conditions. Additional classes are organized for students for whom the language of instruction is not a mother tongue. Equality of distribution of educational opportunities is an explicit strategic objective, implemented through different programs of which some are realized at regional level or by individual schools, students are offered a series of extracurricular activities.

Special measures

All the proposed measures are most generalized, and primarily refer to organizational aspects of education system. In principle, these measures do not directly affect the quality of educational outcomes but they do represent a context directing efforts in education and enabling systemic work on improvement of the quality of educational outcomes. In addition, there is a whole set of measures of a lower level of generalization which are intended for direct interventions in teaching (content, teaching methods, education of teachers, actions related to particular vulnerable groups of students...) and which are directly linked to the quality of educational outcomes. Without entering into detailed descriptions, we list here certain important concrete activities pertaining to this group.

Special measures for students of the most vulnerable families

With respect to quality of education available to the poorest students in Serbia, on the basis of analysis of PISA data the following findings were made: (a) very high number of the poorest students (60-75%) are functionally illiterate after 9 years of education which is by some 20-25 percentage points more than in the general population, (b) the quality of education available to the poorest is at a low level and significantly below the average quality of education, and (c) the possibility of poor students enrolling after completing primary schools, into secondary schools with a lower quality of education is higher even when their level of knowledge equals that of other students. If we add to that that poor children are, according to the LSMS data (Republic Statistical Office 2007), considerably less covered by preschool education, it may be concluded that one need not inquire into the reasons that many poor children are functionally illiterate after 9 years of schooling, rather how is it possible that some of the poorest children manage to develop functional literacy in spite of all problems and obstacles.

With respect to the poorest children, a whole set of actions is required such as:

- Facilitated and free access to preschool institutions (so as to make up for adverse family conditions for development) as early as possible, and possibly by the age of three,
- Provision of free textbooks and other teaching equipment (and school meals, wherever possible),
- Ensure inclusion of the poorest children in schools with extended stay,
- Ensure, through national testings, special monitoring of whether the children from the poorest families managed to attain the level of reading literacy required for continuing schooling within subject-based teaching (for instance, at nation-wide testing of students of third form in 2004, almost 30% of the students

from the poorest families did not manage to attain even the lowest level of performance as compared to only 1% of students coming from the wealthiest families) – ensure special expert support to schools in regions with large number of poor children who have not managed to attain the required level of reading literacy, through special curricula in order to secure that these children are prepared for transition to subject-based teaching.

- Ensure scholarships for secondary and university education for successful students of the poorest families in order to enable them to have other options than enrolling into secondary vocational schools because of a relatively quicker securing of educational qualifications and jobs.
- Identify primary schools, on the basis of qualification exam results, wherein the differences in educational performance between children of different socio-economic status are the lowest – define distinct ways in which these schools manage to secure approximately the same quality of education for all students, document best practice examples and share them with other schools.

Special measures for development of reading literacy

Reading literacy is, as evident from the analyzed data, at a significantly lower level relative to mathematical and scientific literacy. The lag relative to international average is at the level of one standard deviation. This suggests the need for reading literacy to be in focus of reforms of the existing teaching practices, specially bearing in mind that education in Serbia is systemically engaged only in training in initial reading, but not in development of skills of „reading for learning purposes“. Reading literacy may be promoted and developed in an environment displaying the following characteristics: a conscious effort made in all classes/subjects to improve reading literacy; teachers are trained (training organized and brochures), and curricula stipulate development of reading skills on different content; school reading program is defined more in line with the interests of students; the students are given independence in critical review of works of literature, their right to opinion recognized, etc.

Individualization of teaching and greater implementation of active learning methods

Uniform curricula supported by uniform textbooks leave little space for individualization of work in class, and the general instructions that curricula is giving to teachers are at high level of generalization. Neither are they good guidelines to the teachers as to how to shape teaching in order to maximize the effect of learning/teaching, and the time spent in class more rationally. More complex competencies that we wish to develop in students during mandatory schooling entail direct involvement of the students, organization of teaching through problem situations resolved interactively and ensuring collaboration in fulfillment of teaching requirements. During the past years, Serbia developed numerous programs of expert advancement of teachers focusing on promotion and development of complex competencies through regular curricula and in mandatory activities (e.g. active learning /teaching, culture of critical thinking, reading and writing to critical thinking..). A sound starting basis is for these programs to be systematically implemented in teaching, that curricula be more concrete about the ratio of content and methods of work, as well as to embed the experiences of these programs into regular schooling of teachers.

Reorganization and improvement of primary education and professional development of teachers

The quality of training of teachers for the profession is of crucial relevance for the effects produced by the education system. With the exception of teaching faculties, the practice in Serbia is that future teachers are primarily educated for their profession of choice so that the so called „teaching subjects“ (didactics and teaching methods) are a secondary part of education or are totally non-existent. In other words, the teachers in Serbia are highly qualified for a chosen area, but are not/are insufficiently trained for the teaching profession, so they lean more on their personal intuition than on systematized knowledge when entering a classroom. Regretfully, among the expert training curricula offered lately, curricula directed at competency development prevail, instead of those supporting and developing skills relevant for teaching. And thus we end up with chronic disputes over marking, already described here, traditional organization of teaching, insistence on reproductive skills. Reforming the

training of teachers, before and during exercise of the profession, would entail that they are primarily trained to be teachers as is the practice in the majority of education systems which are more score better in educational performance of students. With reference to the content that is required as a preparation for the profession, skills on age and developmental characteristics of students (development and pedagogic psychology), methods of work and their correspondence to the content and objectives of teaching (didactics and teaching methods of certain subjects), as well as skills related to creating a incentive-driven atmosphere in the class. In addition to the cognitive element, the atmosphere also includes the social and emotional elements. Namely, teaching will be more efficient if a student is not disciplined by fear as is a frequent practice and if his motivation and interests are recognized. Establishment of „sound“ relations should be much more the responsibility of teachers than of students.

REFERENCES

- American Institutes for Research (2007). *Lessons learned from US international science performance*. Washington, American Institutes for Research
- Baumert, J. (2007). On the way to causal inferences: teacher knowledge, teaching and student progress within the framework of PISA. Paper presented at the Biannual Meeting of the European Association for Research on Learning and Instruction, Budapest, August 28-Sept 1, 2007.
- Baumert, J., Blum, W. & Neubrand, W. (2002). *Drawing the lessons from PISA 2000 – Long-term research implications: Gaining a better understanding of the relationship between system inputs and learning outcomes by assessing instructional and learning processes as mediating factors*. Symposium on Assessing Policy Lessons from PISA, 18-20 November 2002, Berlin
- Bertschy, K., Cattaneo, M.A., and Wolter, S.C. (2008). *What Happened to the PISA 2000 Participants Five Years Later?(Discussion paper No. 3323)*. Bonn, The Institute for the Study of Labor (IZA)
- Bonnet, G. (2002). Reflections in a Critical Eye (1): on the pitfalls of international assessment. *Assessment in Education*, 9, 3, pg. 387-399
- Bradshaw, J., Sturman, L., Vappula, H., Ager, R. and Wheeler, R. (2007). *Achievement of 15-year-olds in England: PISA 2006 National Report* (OECD Programme for International Student Assessment). Slough, NFER.
- Broadfoot, P., Murphy, R., and Torrance, H. (1990). *Changing educational assessment*. London, Routledge
- Cavanagh, S (2007). Poverty's Effect on U.S. Scores Greater Than for Other Nations. *Education Week*, December 7, 2007
- Chiu, M.M., Xihua, Z. (2007). Family and motivation effects on mathematics achievement: Analyses of students in 41 countries. *Learning and Instruction*, doi:10.1016/j.learninstruc.2007.06.003
- Council of Europe (2002). *Common European Framework of Reference for Languages: Learning, teaching, assessment*, Cambridge, Cambridge University Press
- European Commission (2001). *European report on the quality of school education: Sixteen quality indicator*. Luxembourg, Office for Official Publications of the European Communities
- Fiske, E. B. (2000). *Assessing Learning Achievement*. Paris, UNESCO
- Gipps, C. (1994). *Beyond Testing: Towards a Theory of Educational Assessment*, London, The Palmer Press
- Goldstein, H. (2004). International comparisons of student attainment: some issues arising from the PISA study. *Assessment in Education*, 11, 3, pg. 319-330
- Gorard, S. and Smith, E. (2004) An international comparison of equity in education systems?, *Comparative Education*, 40, 1, 16-28
- Grisay, A. & Monseur, C. (2007). Measuring the equivalence of item difficulty in the various versions of an international test. *Studies in Educational Evaluation*, 33, pg. 69–86
- Gustafsson, J.-E. (2007). Understanding causal influences on educational achievement through analysis of differences over time within countries. In T. Loveless (Ed.) *Lessons Learned: What International Assessments Tell Us about Math Achievement*. Washington, DC: The Brookings Institution.
- Haste, H. (2001). Ambiguity, Autonomy, and Agency: Psychological Challenges to New Competence. U D.S. Rychen & L.H. Salganik (Eds), *Defining and Selecting Key Competencies*. Seattle, Hogrefe & Huber Publishers, pg. 93-121
- Howie, S.J. & Plomp, T. (2005). TIMSS-Mathematics findings from National and International Perspectives: In search of explanations. *Educational Research and Evaluation*, 11, 2, pg. 101-106.
- Husen, T., and Postlewaite, T. N. (1985). *The International Encyclopedia of Education: Research and Studies (Vol. 3)*. Oxford, Pergamon Press
- Hutmacher, W., Cochrane, D., and Bottani, N. (2001). *In Pursuit of Equity in Education: Using International Indicators to Compare Equity Policies*. Geneva, SRED
- International Reading Association (2003). *Policy and practice implications of PISA 2000: Report of the PISA task force*. Newark, US, International Reading Association
- Kjærnsli, M. (2002). *Finding New Goals – PISA and TIMSS in light of Scientific Literacy*. Conference Changes and Challenges, November 8 - 9 2002, Copenhagen, Denmark
- Lafontaine, D. & Monseur, C. (2007). *Impact of test characteristics on gender equity indicators in the assessment of reading comprehension*. Paper presented at the European Conference on Educational Research, Ghent, September, 19-22, 2007
- Lie, S., Lynnakyla, P., and Roe, A. (2003). *Northern Lights on PISA – Unity and Diversity in the Nordic Countries in PISA 2000*. Oslo, University of Oslo
- Livingston, K. & McCall, M. (2005). Evaluation: judgemental or developmental?, *European Journal of Teacher Education*, 28, 2, pg. 165–178
- Madison, B. L., and Steen, L. A. (2003). *Quantitative Literacy: Why Literacy Matters for Schools and Colleges*. Princeton, New Jersey, National Council on Education and the Disciplines, pg. 75-89
- Marks, G. N. (2006). Are between- and within-school differences in student performance largely due to socio-economic background? Evidence from 30 countries. *Educational Research*, 48, 1, pg. 21-40

- Neidorf, T.S., Binkley, M., Gattis, K., and Nohara, D. (2006). *Comparing Mathematics Content in the National Assessment of Educational Progress (NAEP), Trends in International Mathematics and Science Study (TIMSS) and Program for International Student Assessment (PISA) 2003 Assessments*, Washington, National Centre for Education Statistics
- OECD (2001). *Knowledge and Skills for Life: First Results from PISA 2000*. Paris: OECD.
- OECD (2004). *Learning for Tomorrow's World: First Results from PISA 2003*. Paris, OECD
- OECD (2005). *PISA 2003 Data Analysis Manuals for SPSS and SAS users*. Paris, OECD
- OECD (2005). *PISA 2003 Technical Report*. Paris, OECD
- OECD (2006). *Are students ready for a technology-rich world? What PISA studies tell us*. Paris: OECD.
- OECD (2006). *Assessing Scientific, Reading and Mathematical Literacy: A Framework for PISA 2006*. Paris, OECD
- OECD (2007). *Education at a Glance 2007*. Paris, OECD
- OECD (2007). *PISA 2006 Science Competencies for Tomorrow's World (Vol 1)*. Paris, OECD
- OECD (2007). *PISA 2006 Science Competencies for Tomorrow's World (Vol 2)*. Paris, OECD
- OECD (2008). *Education at a Glance 2008*. Paris, OECD
- OECD (2008). *Measuring Improvements in Learning Outcomes: Best Practices to Assess the Value-Added of Schools*. Paris, OECD
- Polish EURYDICE Unit (2005). *The System of Education in Poland*, Warsaw, Foundation for Development of the Education System
- Rindermann, H. (2008). Relevance of education and intelligence for the political development of nations: Democracy, rule of law and political liberty. *Intelligence*, 36, 4, pg. 306-322
- Robinson, P. (1999). The tyranny of league tables: international comparisons of educational attainment and economic performance. U R. Alexander, P. Broadfoot & D. Philips (Eds.). *Learning from Comparing: new directions in comparative educational research (Vol. 1): Contexts, Classrooms and Outcomes*. Oxford, Symposium Books
- Rychen D.S., and L.H. Salganik (2003). *Key Competencies for A Successful Life and a Well-Functioning Society*. Cambridge, Hogrefe & Huber
- Rychen, D.S., and L.H. Salganik (2001). *Defining and Selecting Key Competencies*. Seattle, Hogrefe & Huber Publishers
- Rychen, D.S., L.H. Salganik, and M.E. McLaughlin (2003). *Selected contributions to the 2nd DeSeCo symposium*. Neuchatel, Switzerland, Swiss Federal Statistical Office
- Sahlberg, P. (2008). A letter to a next education minister. U B. Chakroun and P. Sahlberg (Eds.), *Policy learning in action*. ETF Yearbook 2008. Brussels: European Training Foundation.
- Sahlberg, P. (in print). Educational change in Finland. U A. Hargreaves, A. Lieberman, M. Fullan, and D. Hopkins (Eds.), *Second International Handbook of Educational Change*. New York: Springer
- Salganik L.H., Rychen D.S., Moser U., and Konstant J. W. (1999). *Projects on Competencies in the OECD Context - Analysis of Theoretical and Conceptual Foundations*. Neuchâtel, Switzerland, Swiss Federal Statistical Office.
- Simola, H. (2005). The Finnish miracle of PISA: historical and sociological remarks on teaching and teacher education. *Comparative Education*, 41(4), 455-470.
- Trier, U. (2001). *12 Countries Contributing to DeSeCo – A Summary Report*. Neuchâtel, Switzerland, Swiss Federal Statistical Office.
- University of Helsinki's Centre for Educational Assessments, "Bright Country Finland", website for information on PISA and Finland, <http://www.pisa2006.helsinki.fi/>
- Valijarvi, J., Linnakyla, P., Kupari, P., Reinikainen, P., and Arffman, I. (2002). *The Finnish Success in Pisa and Some Reasons Behind It*. Jyvaskyla, Institute for Educational Research
- Willms, J. D. (1999). *Inequalities in Literacy Skills Among Youth in Canada and the United States*. Ottawa, Statistics Canada
- Willms, J. D., and Kerchoff, A. C. (1995). The Challenge of Developing New Educational Indicators. *Educational Evaluation and Policy Analysis*, 1, pg. 113-131
- Willms, J. D., Smith, T. M., Zhang, Y., and Tramonte, L. (2006). School quality and equity in Central and Eastern Europe (Special issue). *Prospects*, 36, 4/140
- Wittwer, J., & Senkbeil, M. (2007). Is students' computer use at home related to their mathematical performance at school? *Computers & Education*, doi:10.1016/j.compedu.2007.03.001