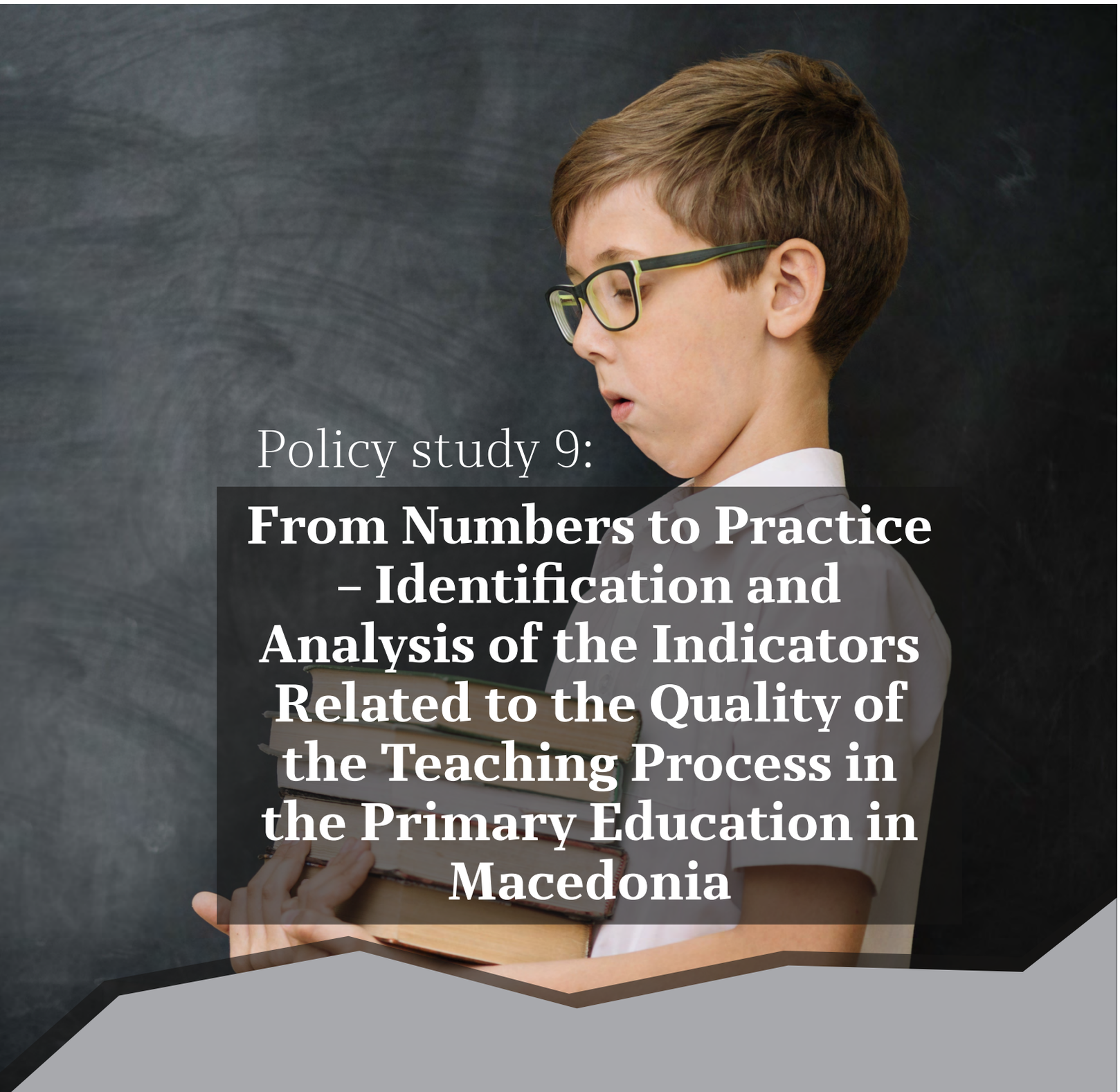
FISCAST



Policy study 9:

From Numbers to Practice – Identification and Analysis of the Indicators Related to the Quality of the Teaching Process in the Primary Education in Macedonia

Authors:
Ana Mickovska-Raleva
Ana Tomovska Misoska
Olimpija Hristova Zaevska
Suzana Cherepnalkovska
Vesna Kostikj Ivanovikj

FINANCE THINK
OUT OF THE BOX

From Numbers to Practice – Identification and Analysis of the Indicators Related to the Quality of the Teaching Process in the Primary Education in Macedonia

Authors:
Ana Mickovska-Raleva
Ana Tomovska Misoska
Olimpija Hristova Zaevska
Suzana Cherepnalkovska
Vesna Kostikj Ivanovikj

Reviewer:
Natasha Angeloska Galevska, PhD

This product is prepared within the project “FISCAST+: Fiscal transparency and accountability improves policies in quality of life, education and health” funded by the UK Government with the support of the British Embassy Skopje. The content of this publication does not necessarily reflect the position or the opinions of the UK Government.

Contents

List of abbreviations and acronyms

BDE	Bureau for Development of Education
SEI	State Educational Inspectorate
ICT	Information and Communications Technology
MES	Ministry of Education and Science
OECD	Organisation for Economic Co-operation and Development
PISA	Programme for International Student Assessment

Summary

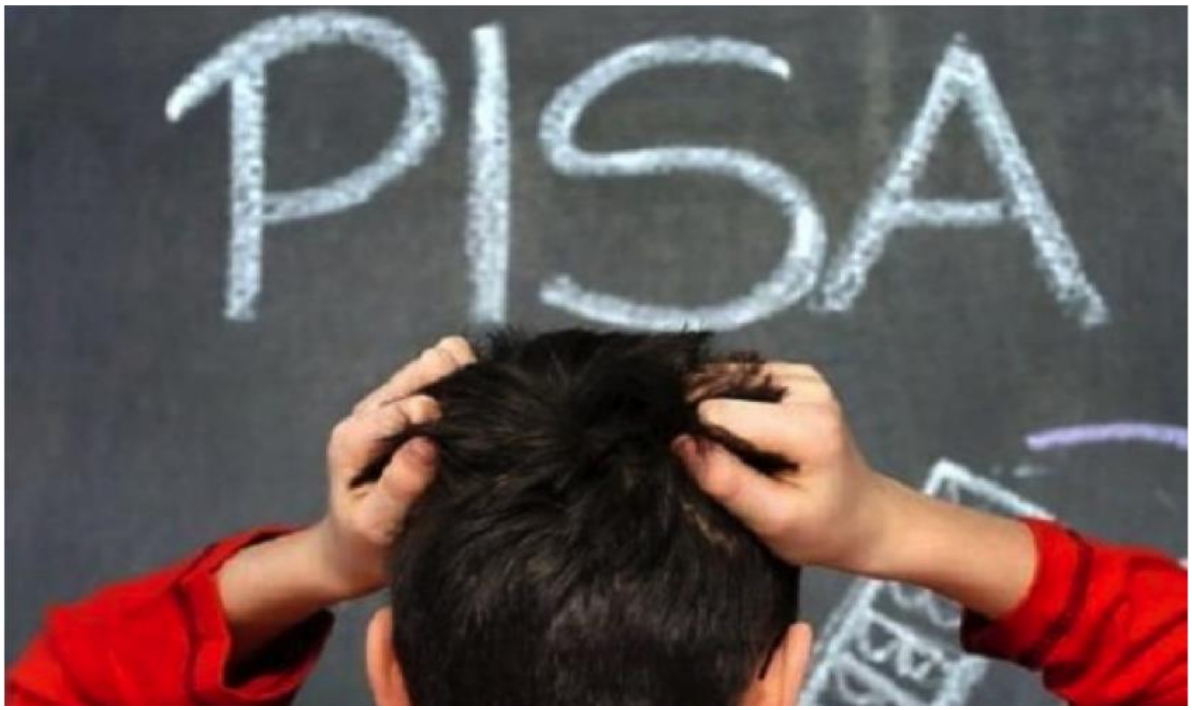
There are multiple factors impacting the teaching process and student performance in specific cognitive domains. PISA testing, in its concept, includes examination of numerous non-cognitive factors, which are potentially linked to student achievement. Nevertheless, despite the vast data availability, so far no in-depth analysis was made on national level relating to the PISA testing results and no research on the factors linked to the results. This research is aimed at filling that gap through a combined method approach. First, a regression analysis was made on the impact of various non-cognitive variables of student achievement in Macedonia. Then, through a field survey consisting of the use of quantitative and qualitative methods, a more thorough analysis was performed on some of the most significant variables identified through the regression analysis.

Key words: PISA testing, competencies, good quality teaching

INTRODUCTION

The formal education process is aimed at preparing students for their future life. Therefore, oftentimes, the competencies that students acquire or what they learn to do at the end of specific educational cycles is considered as the most important indicator of an education system quality. The competencies / student achievements are an output indicator that is affected by different factors / variables of the environment, including: national education policy, school policy and teaching process in the classes. Therefore, student achievement cannot be analysed in a vacuum and instead numerous factors should be considered in their interpretation.

The PISA testing administered by OECD is aimed at determining the competencies of 15-year-old students in science, mathematics and reading literacy; and at the same time to find what factors have a predominant impact on the teaching quality and, hence, on the competencies that participants acquire. Macedonian students were included in the testing in 2000 and in 2015. The results from both measurements indicate that Macedonian students achieve results under the international average. This means that students in Macedonia, during their primary education, do not acquire sufficient competencies through which they would offer a higher value on the national labour market, thus contributing to the economic growth. At the same time, this also means that with their competencies they are not sufficiently competitive on the global labour market and they will have difficulties fitting in the new economic trends of the so-called "knowledge-based economy". Insufficient human resource quality, on the other hand, has consequences for the development of economy in both national and international context.



In the past 15 years, since Macedonia began participating in international achievement testings, the education policy makers have an insufficiently systematic approach to the problem of low

student achievement. Reforms being implemented are usually not based on systematically collected data; they are often not interrelated and are not debated with a large portion of the stakeholders (factors) in the education system. Consequently, oftentimes, the reforms are not fully accepted and fail to achieve the envisaged objective. Therefore, in a period of 15-years between the two testings, not only did student achievement not improve, but it deteriorated. Specifically, the score in mathematics was reduced from 381 in 2000 to 371 in 2015; while in science it went from 401 in 2000 to 384 in 2015 (OECD, 2016a). From the aspect of proficiency levels defined in PISA[1], students from Macedonia, in average, continuously reach the second lowest level (1a), which indicates "the ability to use basic or everyday content and procedural knowledge to recognize or identify explanations of simple scientific phenomenon. With support, they can undertake structured scientific enquiries with no more than two variables" (OECD/PISA, 2015).

Although there are other competencies important for the development and long-term success of students, the competencies measured by PISA are good performance indicators of the education policy (Schleicher, 2007). Namely, PISA testing is administered on a sample of 15-year-old students, who at that age are still covered by the formal education system (OECD, 2016); and it focuses on the ability of students to apply their knowledge and skills in everyday situations (Valijarvi et.al., 2000) through internationally recognized benchmarks for competencies (OECD, 2001), and through additional information on the characteristics of the education systems and characteristics of students. As such, PISA testing results are used as starting information for educational reforms and assessment of the education policy in several European countries (Grek, 2009).

The main focus of PISA in 2015 was to determine the competencies in the domain of science. This domain covers the ability for critical review and understanding of concepts linked to science and scientific approach. As students who have a good level of science literacy are considered those with competencies to:

(1) **explain different concepts scientifically;**

(2) **evaluate and design a scientific approach when reviewing phenomena** (able to critically assess scientific findings); and

(3) **interpret data and facts by applying a scientific approach** (able to interpret the meaning of scientific evidence and their implications for a specific audience, in their own words and, if necessary, by using charts or other presentation methods) (OECD, 2016c).

Studies show that there are multiple factors impacting student performance in specific cognitive domains. However, most of the studies until now were based on cross-tabulations and correlations, so it is particularly important to start measuring effects and testing the

[1] PISA 2015 defines seven levels of proficiency - from 1b to 6, with the following lowest score for each level (in brackets): 1b (261), 1a (335), 2 (410), 3 (484), 4 (559), 5 (633) и 6 (708). For more information see: http://www.oecd.org/pisa/test/summary-description-seven-levels-of-proficiency-science-pisa-2015.htm

interconnection of various factors with the performance in different domains of PISA, which is one of the objectives of this research.

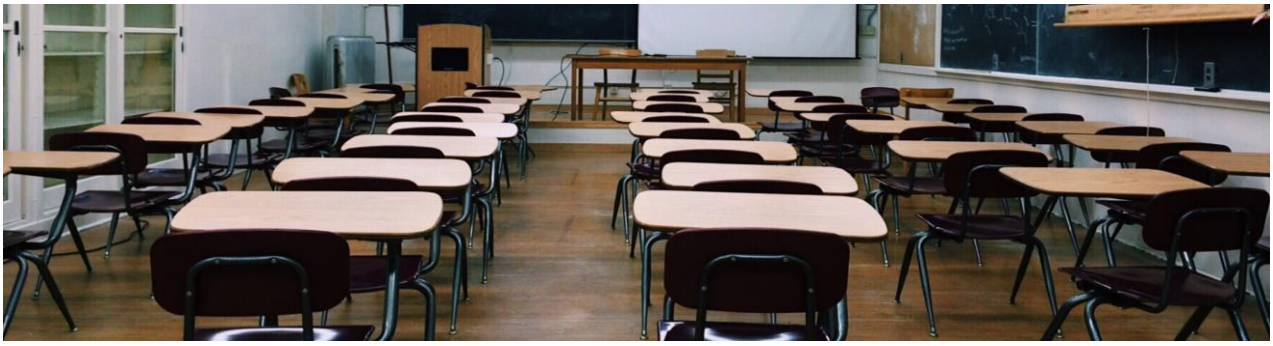
In addition, on national level, no in-depth analysis has been made concerning the results of PISA testing or a research on the policy impacting these results. Therefore, this research is aimed at examining the link between existing data about student achievement and factors related to them. Also, the analysis enables the development of a policy based on specific, scientifically collected and analysed data.

METHODOLOGY

Tasks of the research

1. To determine the factors linked to student achievement in the 2015 PISA testing.
2. To investigate the opinions of teachers and students concerning the factors determined as the most significantly linked to student achievement in the 2015 PISA testing.
3. To issue recommendations to specific factors in the education system for overcoming the issues detected by the analysis.

The research used combined research techniques: *quantitative* (regression analysis of data from the databases of the 2015 PISA testing; descriptive and correlation analysis of data collected through a field survey) and *qualitative* (analysis of the contents of the focus group discussions). Therefore, the research consists of three parts: (1) analysis of the results from the international PISA testing in 2015 intended to find the most important factors impacting student achievement; (2) analysis of teachers' perceptions about the teaching practice and student achievements through surveys; and (3) analysis of the perception of students in the ninth grade about the teaching practice and achievements through focus groups. The combination of these methods was selected in order to obtain a more comprehensive picture as to where Macedonia stands in the context of international education practice, and also how the style of work and reforms being implemented impact student achievement.



ANALYSIS OF 2015 PISA RESULTS

In order to identify the dominant factors impacting student achievement, an analysis was performed on the 2015 PISA testing results. In addition, an analysis was performed on the level of competency development and on the PISA knowledge levels achieved by students in Macedonia in comparison to the international average.

In the **first part**, a regression analysis was performed on the data from the most recent results of the PISA survey. In 2015, 72 countries participated in the PISA testing, covering a total of 540,000 students. This is the second time that Macedonian students have participated in this testing. The main focus of PISA in 2015 was to determine the competencies in the domain of science. This domain covers the ability for critical review and understanding of concepts linked to science and scientific approach. In fact, this means that most of the cognitive questions in the testing are from the domain of science literacy, and a smaller portion are a combination of questions for mathematics and reading literacy. Also, the additional questionnaires for students, teachers and parents contain questions relating to the teaching, learning and support that students receive for mastering course contents relating to science. This is precisely why the analysis of factors important for the difference in student achievement focuses on the proficiency in the domain of science literacy.

Another limitation in the data analysis arises from the fact that different countries may choose additional questionnaires that would be included in the survey. This, in effect, means that in certain countries data is collected only from students answering cognitive questions and filling in questionnaires on their educational experience. In other countries there could also be data from teachers filling in a questionnaire about the teaching practice, principals providing an assessment of the school and education system, and from parents expressing their own views on the educational process of their children and on the support they provide and on specific family circumstances.

In order to get a comprehensive picture about the factors impacting student achievement, this research includes an analysis of the data from the highest-performing countries and from the lowest-performing countries in PISA 2015 in the domain of science literacy. In the analysis, we used the publicly available databases. In the two regression equations we used the same parameters so that the factors impacting student achievement could be seen from a comparative aspect. The selection of factors was made based on previous research and analyses on the factors impacting student achievement of PISA in different domains (Bailey and Borooah, 2010; Fuchs and Woessmann, 2004; Lee, 2009; OECD, 2015; OECD 2015b; OECD 2016a; OECD, 2016b),

One regression equation was developed for the highest-performing countries, and the other one for the lowest-performing countries. The highest-performing countries include: **Singapore, Japan, Estonia, Finland and Canada.** The lowest-performing countries include: **Tunisia, the**

Republic of Macedonia, Kosovo, Algeria, and the Dominican Republic. Since most countries lacked data from the questionnaires for principals and parents, the regression equations included data from the cognitive questions as dependent variables, and certain indices obtained through statistical procedures for merging several questions on the same topic from the questionnaires for students and teachers. In addition, a regression equation was also developed only for data from the Republic of Macedonia.

All three regression equations used a linear regression (Ordinary Least Squares - OLS), while the dependent variables were extracted from the plausible values of PISA's database. In order to overcome potential problems arising in the sample selection in each country, and to obtain more adequate assessments of the population, the analysis used a statistical adjustment of the sample per student. In parallel, we again used an index from the base following PISA's recommendations for data analysis (OECD, 2009). The parameter F was used to estimate the significance of each regression equation. In the regression, we also use R^2, which essentially denotes what percentile of variance of the independent variable could be attributed to the variance of independent variables, which are part of the equation. To estimate the participation of each individual parameter from the equation of the dependent variable we used β-coefficients, which are standardised coefficients to allow a comparison of the relative importance of each parameter from the regression equation. If they are positive, then there is a positive connection between the dependent and independent variable, and if they are negative, then the increase in the independent variable is connected to the decrease in the dependent variable. When a β-coefficient is statistically significant, then for each increase or decrease in the independent variable for one standard deviation in the dependent variable there is either an increase or a decrease for the value of that B-coefficient. In the interpretation of results, this could be important from the aspect of estimating those independent variables that contribute more to the increase or decrease in the dependent variable.

ANALYSIS OF THE PERCEPTIONS OF TEACHERS FOR THE TEACHING PRACTICE AND ACHIEVEMENTS - SURVEYS

Complementary to the first part, the second part of the research includes surveys of teachers from ten primary schools in the Republic of Macedonia intended to determine their practice and views on different aspects important for the teaching process quality. Surveys were conducted with teachers in ten primary schools in the Republic of Macedonia, from four regions: Southeast, Vardar, West and Skopje region, both urban and rural. The surveys were conducted in March 2017. (School details are provided in Table no. 1).

Table 1. Schools covered in the field analysis

School type	Number of respondents	School
rural	26	"Simche Nastevski" PS - Vratnica
urban	29	"Lirija" PS - Tetovo
rural	20	"Kliment Ohridski" PS - Drachevo
urban	28	"Zhivko Brajkovski" PS - Skopje
urban	23	"Metodi Mitevski - Brico" PS - Lozovo
rural	41	"Tode Hadji Tefov" PS - Kavadarci
urban	18	"J.A.Komenski" PS - Skopje
rural	15	"Avram Pisevski" PS - Bardovci
urban	22	"Vidoe Podgorec" PS - Strumica
rural	26	"Geras Cunev" PS - v. Prosenikovo
Total:	**248**	

A total of 248 respondents were covered, 202 of them were female and 45 male. One of the respondents has not filled in the gender field. 37 of the respondents are between the ages of 22 and 34 years, 114 are between the ages of 35 and 49 years, and 80 of the respondents are over 50 years old. 86 percent of the respondents have completed higher education, 10 percent have postgraduate education, and four percent have an associate degree. Regarding the years of work experience in the profession, 39 percent have 0 to 10 years of work experience, 28 percent have 11 to 20 years of work experience, 19.5 percent have 21 to 30 years, 13 percent have 31 to 40 years, and 0.5 percent has over 40 years of work experience in the profession. The sample covers 1.4 percent of the total number of teachers in the regular primary schools[2], and has a relatively high degree of statistical error (+/- 6). Hence, in the sample formation, attention was paid to make it diverse in terms of the demographic characteristics of respondents, and characteristics of the school where they work (regarding the location, but also socio-economic and ethnic structure of students).

[2] 17,887 in 2016/17 (State Statistical Office, Education and Science: key indicators)

Questionnaire

The questionnaire included fourteen questions, which were divided into sub-questions in four areas. Respondents answered by level of agreement (strongly agree - strongly disagree), frequency (every hour, two or three times a week, once a week, less than once a week, never), and level of satisfaction (very satisfied, partially satisfied, and very unsatisfied).

In the preparation of questionnaires for teachers, some of the questions were developed for the needs of the specific study, but also questions from previously used international studies were adjusted (The Study of Instructional Improvement (University of Michigan, 2001); OECD Teaching and Learning International Survey (TALIS) (OECD, 2013); PIRLS Teacher Questionnaire (IEA, 2006), PISA 2015 Teacher Questionnaire (OECD, 2016).

Table 2. Structure of the questionnaire for teachers (Appendix 1)

Categories of questions	Area
Methods / techniques applied in the classes Instruments for assessing student achievement Curricula Textbooks Additional and supplementary instruction Time spent in one school class Time spent during a typical school week	**Teaching**
Aspects from the work of a teacher Teaching profession Decision making and effects of the decisions / reforms Participation in professional development trainings Work appraisal	**Profession / school**
Teaching and learning	**Students**
Co-operation with parents	**Co-operation with parents and with the community**

ANALYSIS OF STUDENT PERCEPTIONS OF THE TEACHING QUALITY

The third part of this research covered twelve focus groups carried out in the selected schools with 8 to 10 students from the ninth grade**.** In the selection of students, attention was paid to the gender and ethnic balance and to the balance of students from urban and rural areas. Two of the focus groups were conducted in Albanian language, and the others in Macedonian language. (See question in Appendix 2.)

ANALYSIS

Analysis of 2015 PISA results

This part of the text explains the findings from the regression equations on the factors impacting student achievement in the PISA testing in different countries. In addition, there is a separate presentation of the results of the five highest-performing countries, the five lowest-performing countries and of the Republic of Macedonia.

The main focus of PISA in 2015 was to determine the competencies in the domain of science literacy. That is the reason why the regression equations included student achievements in the domain of science literacy and specific indices obtained through non-cognitive questionnaires. Also, the regression equations included student achievement in the field of science as a dependent variable and various composite indices relating to different aspects of the educational process as independent variables.

The indices are also part of the publicly available data on the PISA testing. The analysis included numerous indices in order to get a comprehensive picture of the factors relating to student achievement. However, only those indices concerning the teaching process and certain students' views were included, with the purpose of obtaining an insight into the parameters that could be influenced systematically in the education system in order to improve student competencies in the domain of science literacy. Previous studies indicate that the achievements in the three domains are correlated (Guzel and Berberoglu, 2005), so a systematic approach to changes in the education system would have an impact on all types of competencies investigated by PISA, even though the focus of the analysis is only on science literacy.

For the Republic of Macedonia, a separate regression equation was also developed to find what factors have a statistically significant connection to student achievement in science literacy. This regression equation does not include all parameters either because some of the parameters are not available for the Republic of Macedonia or some of the questions were not posed or answered in the country.

Table 3 shows the results obtained from the three regression equations. The table notes whether a given parameter has a statistically significant connection to student achievement for each regression equation separately so as to get a comparative overview of the factors. The regression analysis for the five lowest-performing countries explains 44.8 percent of the variability of the dependent variable (R^2=0.448) and is statistically significant (F=1258, p=0.00). For the five highest-performing countries, the model explains 38.6 percent of the variance (R^2=0.386) and is statistically significant (F=16299, p=0.00). The regression equation for the Republic of Macedonia is statistically significant (F=329.466, p=0.00) and explains 30.4 percent (R^2=0.304) of the variance. For all three regression equations there is a large portion of the variance that is not explained by the relevant regression equations. This is primarily due to the fact that PISA includes numerous questions and indices and data from different sources. This research includes only students' answers, and many of the questions are not answered in all countries.

Table 3. Results from the regression equations (dependent variable - student achievements in the domain of science)

Factors	Republic of Macedonia	Five lowest-performing countries	Five highest-performing countries
Discipline in class	+ (β.045***)	+ (.095***)	+ (.172***)
Teacher support	- (-.026***)	- (-.085***)	- (-.104***)
Enquiry-based approach to lessons	- (-.088***)	- (-.148***)	- (-.054***)
Good instruction by the teacher	+ (.064***)	+ (.068***)	+ (.028***)
Intrinsic motivation (enjoyment of learning science)	+ (.038***)	insignificant	+ (.154***)
Interest in scientific knowledge	not available	insignificant	+ (.042***)
Instrumental motivation (science courses as a means for future achievement)	- (-.085***)	- (.111***)	- (-.058***)
Expectations for future profession related to science	+ (.110***)	+ (.060***)	+ (.121***)
Subjective feeling of well-being	+ (.057***)	+ (.070***)	- (-.015***)
Achievement motivation	not available	- (-.040***)	+(.019***)
Awareness of the environment	+ (.278***)	+ (.227***)	+ (.118***)
Environmental optimism	not available	- (-.187***)	- (-.064***)
Self-efficacy in science	+ (.115***)	+ (.107***)	+ (.009***)
Epistemic beliefs	+ (.119***)	+ (119***)	+ (.212***)
ICT availability at school	not available	- (-.027***)	- (-.017***)
ICT availability at home	not available	- (.083***)	- (-.034***)
ICT use outside of school for school-related tasks	not available	+ (.012**)	+ (.078***)
ICT use outside of school for entertainment	not available	+ (.0.90***)	- (-.045***)
Participating in out-of-school science-related activities	not available	- (-.136***)	- (-.020***)
Time spent studying outside of school	not available	+ (.038***)	- (-.034***)
Time spent studying science (total weekly)	not available	- (.027***)	+ (.145***)
Material well-being	- (-.024**)	+ (.237***)	- (-.214***)
Socio-economic status	+ (.172***)	+ (.125***)	+ (.214***)
Sex (male)	insignificant	+ (.077***)	+ (.062***)

** level of significance 0.05

*** level of significance 0.01

The results show that there are differences in the connection of different factors with PISA achievements in different countries. The first set of factors investigated is related to the manner of organising the lessons and the teacher's approach to students. This set indicates that, **in all three cases, the discipline in class and teachers' manner of instruction** are positively related to student achievement. This means that when students feel that during science classes students are listening to the teacher without making noise, they quickly start working and work without interruptions, they have a higher score. Also, students with higher scores mention that their teachers **teach well**, which means that they are capable of explaining scientific ideas well; they answer students' questions; they have discussions during classes and demonstrate how things function. These findings are in line with the findings from previous surveys (OECD 2016b).

The teacher support and enquiry-based approach to mastering science material are negatively linked to student achievement. Specifically, students who perceived that, in the teaching process, teachers very often provide **individualised support to students in mastering the material have lower score**. These findings are partially in line with previous surveys indicating that the socio-economic status is an important variable moderating the relationship between perception of support and score. Namely, the relationship of individualised support is positive in students with lower socio-economic status, primarily because these students need additional assistance since the likelihood of receiving that assistance outside of school is small (OECD 2016b). In fact, these findings indicate that there should be a close investigation of the relationship between the type of support provided by teachers and student achievement, and of specific demographic variables for each country separately.

Also, in those situations where teachers use an **enquiry-based approach** more often, for instance, experiments in classes and allowing students to draw conclusions by themselves, to design experiments and debate on the results, students get lower score / results. This is also in line with previous research (OECD 2016b). In interpreting the results, it should be taken into account that this index covers several different activities. Within the index, not all activities are equally associated with PISA results. Therefore, the highest negative association, according to previous surveys, is of the activities covering laboratory work and designing experiments, while activities such as discussions and explanations may also have a positive association (OECD 2016b). In other words, use of specific activities in the teaching process, for instance, laboratory experiments without adequately explaining the cause-and-effect relationship in the experiment and stimulating critical discussion on that topic may negatively affect the readiness of students to use science knowledge. This means that for enquiry-based learning to have a positive impact, teachers have to be well prepared and skilled in "manipulating ideas as well as objects" (OECD, 2016b). Teachers have to be prepared for designing different well-structured teaching methods, techniques and activities with a view to stimulating discussions, explanations and critical thinking in students.

The PISA testing also included questions related to different student views, interests and motivations. One of the important aspects in the education system is stimulating and fostering motivation and interest in students about different areas. Namely, student motivation is linked to their achievement, and may be stimulated or decreased through methods and techniques used in the teaching process, and through different school activities (Hampden-Thomson and Bennett, 2013; Logan and Skamp, 2013).

The findings also show that those students who indicated they **would like to pursue a science-related career** have higher results than other students who expect to have a different profession. Also, those students who stated that learning science is only a means for attaining other objectives (instrumental motivation), for instance a good career, have lower scores. In addition, **intrinsic motivation** in students from countries with the best results and in Macedonia is positively associated with student achievement, while in the countries with the lowest results it has no impact on achievement. What is important for the Republic of Macedonia in this domain is that other studies indicate that, unlike other countries, in Macedonia, girls show a higher intrinsic motivation than boys (OECD 2016a).

Achievement motivation, that is, motivation for continuous improvement and achieving better results is positively associated with student achievement in the five top-performing countries and is negatively associated with the results of students from the five lowest-performing countries. For the most part, achievement motivation is associated with better results. Nevertheless, studies indicate that, in specific circumstances, students who have high level of achievement motivation may feel greater pressure to succeed, which may inhibit their achievement because students have too many doubts and fail to make a decision, and on the other hand, they feel greater test anxiety. For instance, in the Dominican Republic, which is one of the countries with the lowest score in PISA, whole 90 percent of students have high achievement motivation, but also 65 percent have high anxiety level even when they believe they have mastered the material, which may have a negative effect on the performance (OECD, 2017).

Interest in broad science topics, such as biosphere, disease prevention, motion and forces, universe and its history etc., is positively associated with student achievement in the five highest-performing countries and is not related to the PISA results of the five lowest-performing countries.

The findings also show that epistemic beliefs and feeling of self-efficacy in science learning are positively associated with student achievement. **Epistemic beliefs** refer to understanding the process of scientific enquiry and discovering science knowledge, and also changing science knowledge over time (OECD 2016c). **Self-efficacy** refers to students' belief that they have well-developed abilities to use their science knowledge in everyday situations and for solving problems related to science knowledge, which is particularly important for future achievements

and for future success of students. The findings in this research are in line with the findings in other studies indicating that the manner in which students receive feedback may be associated with their level of self-efficacy, same as teaching methods and school activities (OECD 2016a).

As part of the general beliefs and interest of students in science knowledge and environment, PISA also evaluates the **awareness of environmental issues** (student interest in different topics of ecology and environmental protection) and **environmental optimism** (how many of the students believe that some aspects associated with environmental protection will improve over the next 20 years). Students with greater awareness of the environment have better scores, while the level of environmental optimism is negatively associated with student achievement. These findings are in line with previous studies, which also indicate that students, in general, have low levels of environmental optimism (OECD, 2015a).

The findings on ICT availability and use are interesting. Namely, ICT availability at home and at school is negatively associated with the PISA score in science. However, the picture is a bit more complicated than it seems at first glance. Namely, what is positively associated with student achievement in both highest and lowest-performing countries is the **use of ICT for preparation of tasks related to the teaching process**. In the highest-performing countries, the out-of-school use of ICT for entertainment purposes is negatively associated with student achievement; while in the five lowest-performing countries, the use of ICT for entertainment purposes is positively associated with student achievement. Such findings are in line with previous recommendations, which indicate the need of rational ICT use and of improving the proficiency levels for reading and mathematical literacy before focusing on ICT use (OECD, 2015b). Unfortunately, there are no data for the Republic of Macedonia as these questionnaires are optional in PISA.

Regarding the **time spent studying**, there is a noticeable diversity. Namely, in the five highest-performing countries, time spent studying science in school has a positive impact on students' results; and in the five lowest-performing countries, it has an adverse effect. On the other hand, regarding the total time spent by students in mastering school tasks out of school, the impact is reverse, i.e. more time spent studying out of school leads to better results of students in the lowest-performing countries in PISA and worse results of students in the five highest-performing countries. Previous studies indicate that out-of-school study time in many countries is of compensatory nature, i.e. it serves to master the material that was not learned during regular classes, which means that more attention should be paid to the manner of learning science at school and to the time spent learning it (OECD, 2015b).

The participation in extracurricular science-related activities is negatively associated with the PISA performance. Such results are not surprising if taken into account that other studies also indicate that time spent studying does not necessarily mean better learning quality

and that sometimes students learn more efficiently from their environment. Also, findings show that different countries have different study time efficiency; thus in Finland, which is one of the five highest-performing countries, each hour spent in additional learning leads to 14.7 more points in PISA; and in the Dominican Republic, each hour leads to 6.6 more points (OECD, 2016b). This leads to the conclusion that the education system should ensure efficient use of learning time in school and of additional out-of-school learning.

Part of this research is indented to determine to what extent education systems provide equal opportunities for student achievement, regardless of their personal circumstances. In fact, this is a vital part of the education system, since it is particularly important that education offer equal opportunities to all and the acquiring of at least basic knowledge by all students (OECD, 2016a). It is also evident from the results that students of **higher socio-economic status have better PISA score in the science domain**. PISA estimates the socio-economic status based on parents' education, parents' occupations, material well-being and number of textbooks and other educational resources available in the home. These findings are not surprising as students of higher socio-economic status have more possibilities to attend programmes of better quality and more science classes (OECD 2016a). What is particularly important to emphasise is that the recommendations are aimed at providing equal opportunities for all students to use their capacities and talent and to allow at least a basic level of knowledge for all students (OECD 2016a). Many authors criticise the education systems for supporting divisions and inequality (Leathwood and Archer, 2004; Lucas, 2001; Oakes, Joseph and Muir, 2004) and indicate that providing adequate support to students who belong to the risk group of low-performers on different grounds will contribute to improving their chances for social mobility and raising their socio-economic status in the future (Leathwood and Archer, 2004). Results also indicate that boys have better scores than girls, except in the Republic of Macedonia where there is no significant difference in the scores of both sexes.

If the results from the regression equation for the Republic of Macedonia are considered, it can be concluded that there are parameters strongly associated with student achievement. In some cases this link is stronger, even in comparison to the highest-performing countries. Most of those links are due to students' beliefs, views and motivation. Hence, for instance, awareness of environmental issues, i.e. students' knowledge about the condition of the environment, has the highest association with student scores in the Republic of Macedonia, which is also the highest coefficient from the regression equation and is higher than the coefficients for the same parameter in the countries with the lowest and those with the highest scores. There is a similar situation with science self-efficacy, i.e. students' belief that they may apply their knowledge in everyday life. In the Republic of Macedonia, there is also a high association of epistemic beliefs and expectations for building a career in the domain of science or related areas. The association of students' socio-economic status with their PISA results is also significant.

Achievement in developing science literacy competencies: students from Macedonia versus the international average

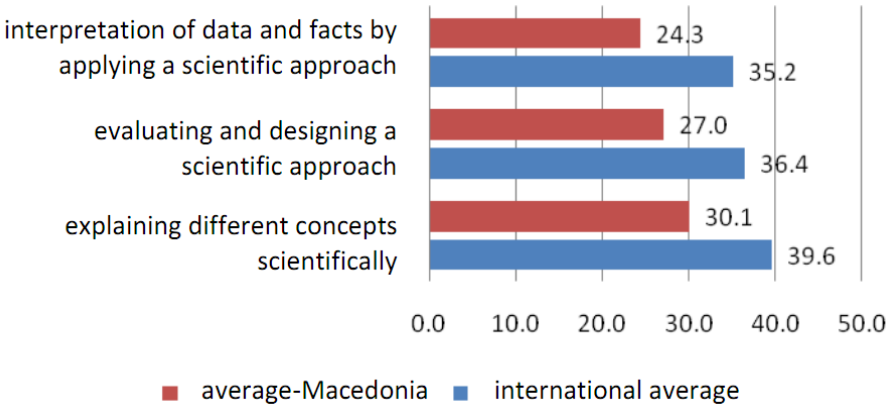
If Macedonian students' scores are analysed in terms of the development level of the three science literacy competencies measured by the PISA testing, it is evident that quite a small percentage of them have correctly answered the questions assessing these competencies. Specifically, on average, only 30 percent[3] of students achieve the competency "Explaining phenomena scientifically", which means that **they are able to recognise, offer and evaluate explanations for a range of natural and technological phenomena**. Internationally[4], the average is 39.6 percent. Furthermore, 27 percent of students in Macedonia have achieved the competency "Evaluating and designing scientific enquiry", which means that **they are able to describe and appraise scientific investigations and propose ways of addressing questions scientifically**, unlike their peers from other countries (combined) where the percentage is 36.4. Finally, one in four students (24 percent) in Macedonia achieves the competency "Interpreting data and evidence scientifically", which refers to the **ability to analyse and evaluate data, claims and arguments in a variety of representations and draw appropriate scientific conclusions**, unlike the international average for achievement of the competency, which is 35.2 percent.

As a whole, all competencies of Macedonian students are significantly less developed compared to the international average (all differences are significant at a level of $p<0.01$) (Chart 1).

[3] The percentage is extracted as an average of students having answered correctly all questions measuring the three competencies. For instance, if there are three questions measuring competency (1), and 30 percent of the students being assessed have answered the first question correctly, 40 percent have answered the second question correctly, and 50 percent have answered the third question correctly; the average would be 40 percent.

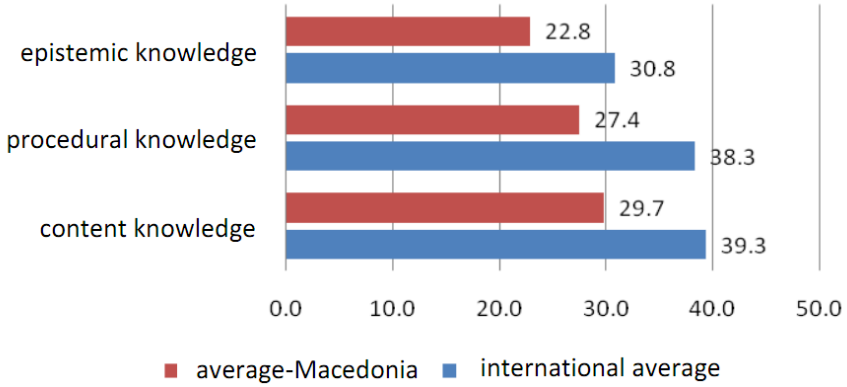
[4] This includes all countries participating in PISA 2015.

Chart 1. Competency achievement: Macedonian students compared to the international average



In PISA's analytical framework, competencies refer to the existence of specific type of knowledge, i.e. understanding of facts, concepts and theories, which are the basis for scientific knowledge. Such knowledge includes (1) knowledge of both the natural world and technological artefacts (**content knowledge**), (2) knowledge of how scientific ideas are produced (**procedural knowledge**), (3) and an understanding of the underlying rationale for the scientific procedures and the justification for their use (**epistemic knowledge**).

Chart 2. Knowledge achievement: Macedonian students compared to the international average



The proficiency level in specific knowledge types follows the development of the three levels of competencies and refers to the tendency to achieve knowledge that is required by the PISA testing from every fourth student in Macedonia. Even though content knowledge (theories, ideas, information, facts) is the most stimulated one by the Macedonian education system, nevertheless, it is developed in only 30 percent of students. Procedural knowledge (how specific knowledge is produced) is developed in 27.4 percent of students, while the level of epistemic knowledge (understanding of the nature and origin of knowledge) is achieved by only 22.8 percent of students. Compared to the international average, a significantly lower number of

students from Macedonia have acquired all three levels of knowledge comprising science literacy (all differences are significant at a level of $p<0.01$). (Chart 2)

Results from the field survey

The following section presents the results from the field survey intended for examining specific aspects from the teaching process, which, according to the findings from the data analysis of the PISA testing, are significantly associated with student achievement. This, primarily, refers to the teaching (and assessment) methods, use of ICT in the teaching process, discipline in class, student motivation, learning time, teachers' perception about their profession and co-operation with different factors in the educational process.

1. Views about the teaching process

According to the data analyses of the PISA surveys, an important aspect associated with student achievement[5] is the work method in classes, specifically, methods of teaching / learning and monitoring the progress / grading. As a result, these aspects will be given particular attention in the analysis below. In addition, both the views of teachers and students will be analysed concerning the curricula and textbooks used in the teaching practice, as elements inextricably associated with the teaching process.

1.1. Application of different teaching methods and techniques

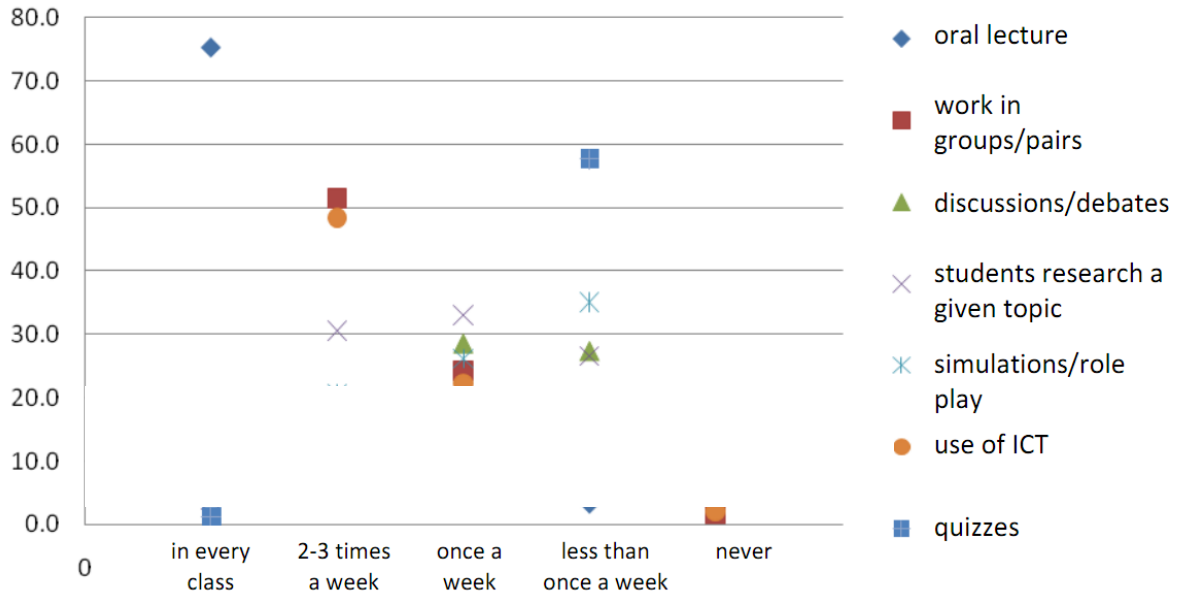
In the last 20 years, various initiatives were implemented to modernise the teaching methods, although it took some time before they became an integral part of the official state policy. The first step was made through the indicators for schools' work quality, which are used by the State Educational Inspectorate during the integral evaluation of schools, where teachers are required to "use different teaching forms and methods", and "well-planned and appropriate active methods for working with students on an individual basis, in small groups or with the whole class". In addition, teachers are required to use "ICT and new educational technologies in the teaching process". (SEI, 2009)

However, answers by teachers-respondents in the survey indicate that oral lecture is still predominant in the classes, i.e. 75 percent of teachers practice this method in every class. According to the results of the regression analysis, this method may be effective, if properly applied, i.e. provided the teacher is able through the lecture to explain the contents well, to connect them to real life and thus arouse students' interest. The next most frequently used method is work in groups / pairs, which is practiced by more than 90 of teachers at least once a

[5] In addition to the time spent teaching science

week. According to the answers of more than half of the teachers, discussions / debates and enquiry-based activities are also practiced at least once a week. (Chart 3)

Chart 3. Frequency of using different teaching methods/techniques



In order to determine how many teachers use teaching methods which require greater engagement and critical thinking by students, we created a composite index variable called "methods for critical thinking, creativity and enquiry"[6], which includes teaching methods that require active and logical thinking by students and thinking directed towards problem solving, namely: discussions and debates, problem solving, enquiry on a given topic, simulations, jigsaw and crossword puzzles, schemes and maps, and quizzes. The variables which are part of this composite variable have a positive correlation between them. Also, the Cronbach's alpha coefficient, which refers to the internal consistency of variables, and is over 0.7, is a conventional standard. In the case of our composite variable, "methods for critical thinking, creativity and enquiry", Cronbach's alpha is 0.741.

Regarding the use of teaching methods and manners of assessment, there is a positive relation between the application of "methods for critical thinking, creativity and enquiry" and all types of assessment: maintaining a portfolio of students, keeping notes, self-assessment, peer assessment, tests, oral examination, essay questions and project assignments. Hence, we can conclude that the manner in which teachers decide to assess students is not overriding in the selection of teaching methods. Nevertheless, the strongest relation is between the use of

[6] Later in the text, the composite variable is also referred to as "modern teaching methods"

modern teaching methods and the use of peer assessment as a grading method (r=0.297, p=0.00).[7] This relation is expected, given that teachers use methods in which students have to think logically and adopt a critical approach to problems presented; and, at the same time, we would like them to encourage students to apply the principles of critical thinking by evaluating the work of their classmates.

School location (rural or urban) has no effects over the type of teaching methods that are being used, which is a positive indicator signalling that teachers from rural schools do not fall behind with respect to the application of modern teaching methods. The teacher type, on the other hand, is strongly associated with the methods applied by teachers during the lessons. Namely, class teachers, unlike subject teachers, use critical teaching methods more often. This is somewhat expected given that class teachers receive significantly more pedagogical and methodological education during their formal education.

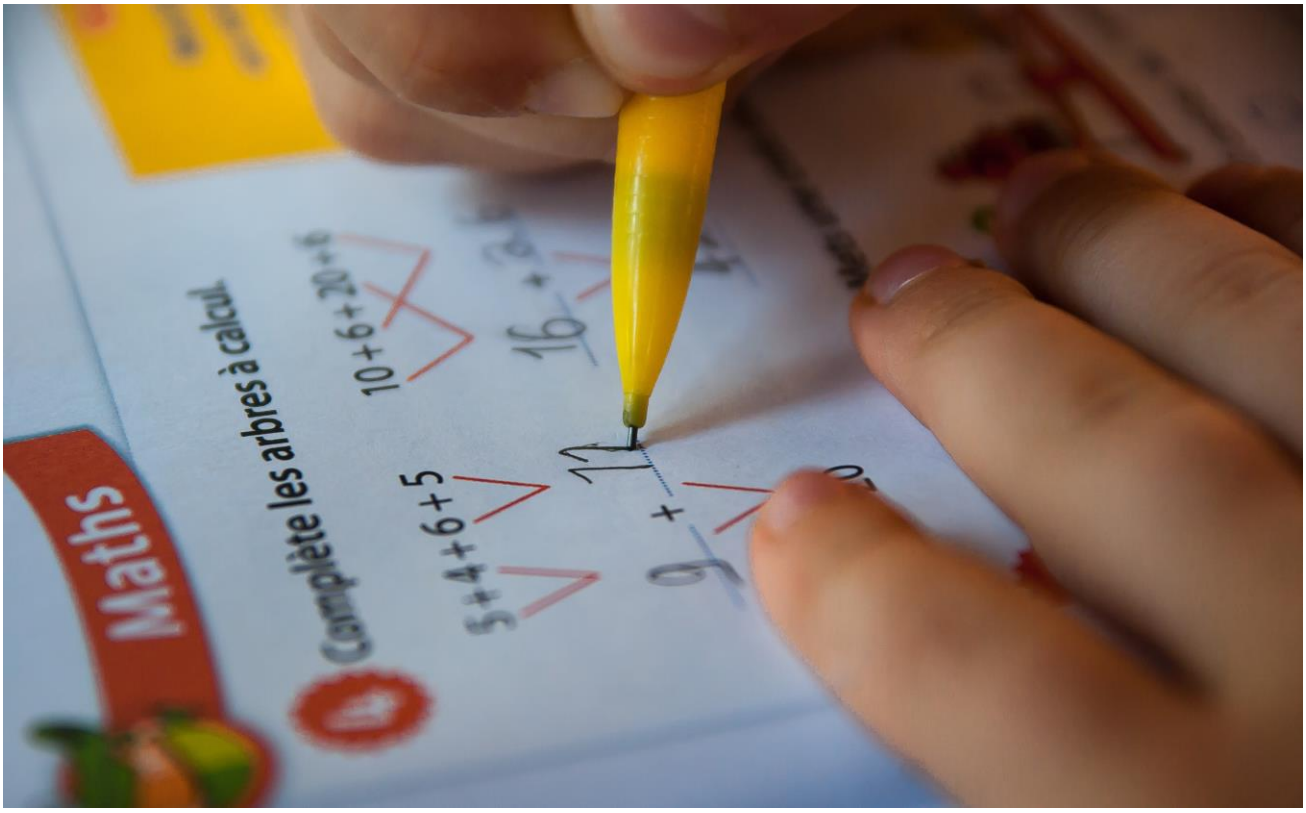
Most of the students participating in focus groups confirmed they have experience with different teaching methods and techniques, although there is prevalent view that the traditional methods are dominant (teacher gives a lecture, while student are passive listeners). The least applied methods are the following: conducting experiments, simulations / role play, and quizzes (to a certain extent), while discussions and watching videos are used more often. (*"We had inter-class games once; we learned grammar through a quiz. We asked for more activities of this type, but they never repeated it".)*

Student answers indicate several aspects that make the teaching process interesting and, at the same time, provide for better mastering of contents: (1) having a friendly relationship with the teacher that allows them to comment / ask questions during classes, and the teacher adequately answering them; (2) teacher's engagement in transferring contents in a clear, interesting and provocative manner; (3) use of modern teaching methods and techniques (enquiry / experiments/ working in groups, quizzes). (*"On those [note: interesting] classes, students have the possibility to pose questions and the teacher is always ready and willing to answer"*).

On the other hand, classes perceived as boring are characterised by: (1) predominance of the teacher during the class and students' lack of freedom to pose questions / comments; (2) insufficient explanation of contents, which leads to students having difficulties in following and mastering contents. What is worrisome is that such classes are perceived as more common. If this data is analysed in the context of factors indicated by the regression analysis as significant for student achievement, it suggests that, for the most part, students are not working in conditions associated with high performance.

[7] This indicator shows that two variables are related, or that when there is change in one of the variables, there is also a change in the other variable. The higher the coefficient, the greater the covariance between variables is. To interpret this coefficient, it has to be statistically significant, which can be seen from the p value that should be $p < .05$.

Some of the students said that communication depends on the teacher's disposition, i.e. on his/her mood. According to student statements, some teachers are not sufficiently concerned to answer additional questions. Moreover, students may even be criticised if they ask for clarification of something that is not clear to them. In one school, students mentioned: "…*sometimes they even insult us that we are not smart if we are asking that question*"; thus students realised that questions concerning further clarification of some aspects from the material are not welcome, which discourages them from posing questions if something is not clear to them in the future. Because of teachers' critical attitude towards students posing additional questions, very often, when the teacher asks if there is anything unclear, the majority of students do not dare pose a question, or they simply answer that everything is clear *("Some professors do not include us during the lesson at all, except in the end of the lesson when they ask if we have any questions, which we never do"*.). However, students agree that the communication problem is not general and refers only to some teachers.

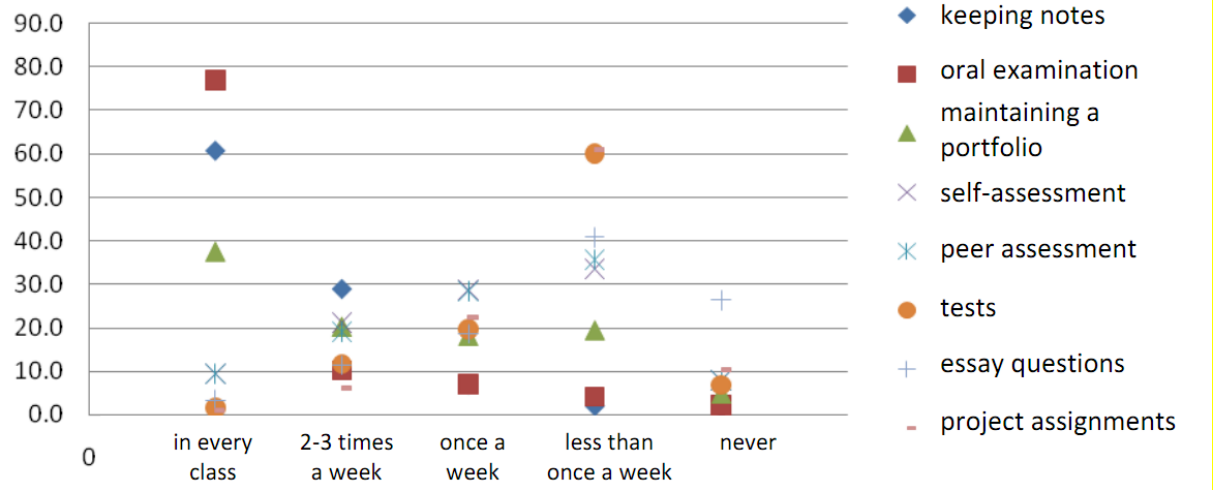


1.2. Application of different methods and techniques of assessment

In the last decade, the education policy makers increasingly focused on continuous monitoring of student progress (SEI, 2009) and on the use of diverse methods, including techniques for so-called formative assessment or "assessment for learning". (BDE, 2015)

Results from the teacher survey indicate that they use different methods for monitoring and assessment of the achievements, but the most commonly used technique is oral examination, which is applied by 77 percent of teachers in every class. In addition, almost all teachers stated that they practice keeping notes on student achievement; most of them do that in every class, or at least two or three times per week. These data indicate the tendency of using methods intended for continuous monitoring of achievements, which is in line with the recommendations on effective teaching. (Chart 4)

Chart 4. Frequency of using different assessment methods/techniques



The use of methods requiring critical reflection by students (self-assessment, peer assessment of students) is less common, which is in compliance with the data on rarer use of methods stimulating critical and creative thinking. When conducting written evaluation of knowledge, teachers more often use tests compared to essay questions. Teachers use project assignments less than once a month, which is understandable given that they require more time to be implemented.

Student answers confirm that teachers usually assess them by posing oral questions or in writing through tests, while the methods of self-assessment and peer assessment are used less often, and only one school mentioned that in the self-assessment process students are governed by criteria set by the teacher.

Regarding what is required for students to know, most of them agree that, in the assessment, teachers usually demand memorising and reproduction of data or definitions as they are presented in the textbook, while the personal opinion of the student or paraphrasing of information are required much less often. (*"Some professors require writing only according to their method, for instance, the mathematics professor accepts that a mathematical task is solved only if it is done through his method, even though, for instance, there are two methods to solve that task."; "The tests never require of us to apply any knowledge, that is, to apply what we have learned by solving some problem from our everyday life, some case, etc. We are required to answer in the same way as it is written in the book and as presented by the teacher".)* Such data is discouraging, particularly given that students will learn in the same way as they will be assessed. Therefore, the application of modern teaching methods that stimulate higher thinking processes is insufficient per se if not accompanied by assessment methods of higher thinking processes.

Small number of student statements report assessment methods that deviate from said model. However, they would also single out teachers who in the assessment process require higher levels of understanding of the material. ("*In biology we have the most creative tests (with tables, drawings, by circling, pictures, true / false)..., and we need to explain an experiment that we have conducted in class; in physics there is something similar, that is, we need to explains a specific experiment".)*

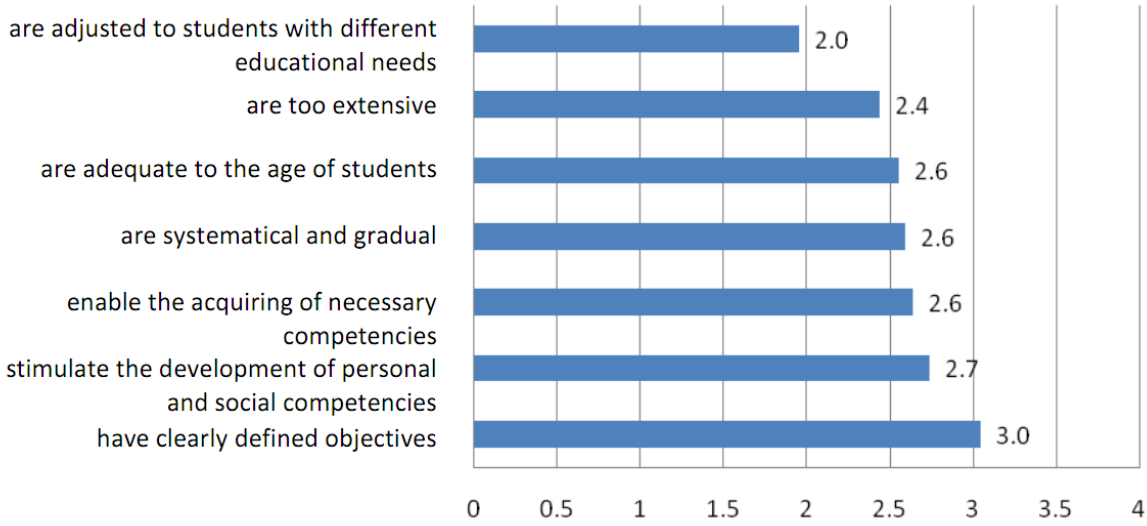
What is characteristic is that the majority of students agree that their knowledge is not the only criterion in which they are assessed. In their opinion, (1) discipline in class often has an impact on grades (*"it may happen that sometimes I am not disciplined, and even though I get an 'A' on the test, I receive a lower grade"; "discipline is more important to teachers than the level of our knowledge"*), and the same is true of (2) grades in previous years, (3) grades in other subjects, (4) results from external testing, but also (5) parents, their position and political affiliation. The mentioning of these factors as influential in grade formation is particularly problematic given that grades should be based only on the proficiency level of the curriculum objectives for a specific subject. Other aspects such as discipline, student motivation etc. can be graded through the assessment of students' behaviour.

1.3. Views on curricula

The Law on Primary Education prescribes that "the curricula shall define the teaching objectives, contents, basic terms, activities and methods in the teaching process, assessment of student achievement, and conditions for implementation of the curriculum and teaching staff norms". ("Official Gazette of RM" No.103/08) Given that teachers are obliged to conduct their teaching in accordance with the guidelines stipulated in the curricula, it is particularly important that they consider these curricula as appropriate.

Teachers-respondents in the survey broadly agree about the objectives defined in the curricula, and show a tendency to agree in the view that objectives are clearly defined. There is a partial agreement concerning the curriculum appropriateness to student age, potential to stimulate the development of personal and social competencies, and its systematic and gradual processing of contents. (Chart 5)

Chart 5. Views on curricula
"Curricula…"



* Note: The chart shows the mean values from teacher answers to questions in a four-point scale (1 - strongly disagree; 4 - strongly agree)

However, despite the positively indicated aspects of curricula, the majority of teachers agree that they are too extensive, and only 20 percent strongly disagree with that view. What is interesting about teachers who think that the curricula are too extensive is that they believe to a greater extent that there are no clear objectives (r= -.0.152; p=0.02), which opens the question whether a comprehensive curriculum is necessary for achievement of set teaching objectives. Another aspect requiring attention is the adjustment of curricula to students with different educational needs, since the majority of teachers believe that they are not adjusted or that they are only partially adjusted.

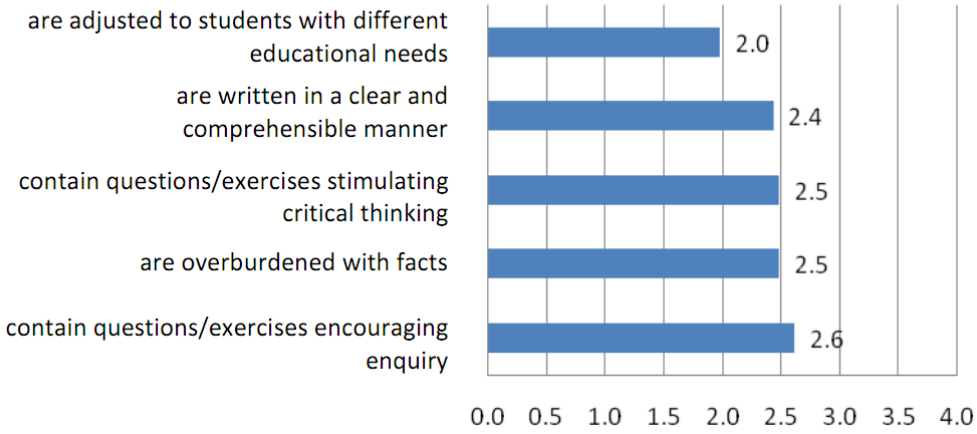
Regarding desired changes in the curricula, students-respondents said that they would like to be able to select curriculum subjects according to their own interest, i.e. subjects they want to learn, such as: programming, graphic design, medicine, life skills, drama classes, etc. (*"I do not like the subjects that we currently have as elective. I think that they need to introduce new ones".*) Also,

students would like for more practical lessons, experiments, more excursions, organised trips and visits to sites, museums, theatres, companies etc.

1.4. Views about the textbooks used in the teaching process

The answers of teachers - respondents in the survey concerning the quality of the textbooks they use are partially aligned with views expressed about the curricula. Specifically, there is a moderate tendency to agree with the claims that textbooks are written in a clear manner; that they stimulate critical thinking; that they use questions / exercises promoting enquiry. At the same time, there is also a tendency to agree with the claim that textbooks are too extensive, i.e. burdened with facts. Teachers are most critical concerning the potential of textbook adjustment to students with different educational needs. (Chart 6)

Chart 6. Views about textbooks
"The textbooks I use..."



* Note: The chart shows the mean values from teacher answers to questions in a four-point scale (1 - strongly disagree; 4 - strongly agree)

Although the general conclusion would be that teachers are partially satisfied with the textbooks they use, there are differences depending on the type of teaching. According to the independent t-test between two groups, class and subject teachers have different views on whether textbooks are written in a clear and comprehensible manner and whether textbooks are overburdened with facts.[8] Specifically - class teachers are more critical concerning the manner in which textbooks are written and their overburdening with facts, probably because they work with younger students for whom the textbook is a particularly important medium for mastering contents.

[8] Clear textbooks: class (M=2.24, SD=0.786), subject (M=2.62, SD=0.869); Overburdened with facts: class (M=2.81, SD=0.848) subject (M=2.14, SD=0.985).

From the student focus group discussions, it can be concluded that they prefer textbooks that (1) are written in a nice /comprehensible manner, that contain (2) pictures, (3) examples, (4) interesting tasks, and (5) that emphasise the important parts. On the other hand, students view as inadequate those textbooks that (1) lack sufficient information, but also those that (2), in their opinion, contain too much unnecessary information, (3) contain too many unfamiliar words / phrases, and (4) have contents (e.g. experiments) that cannot be applied during the classes.

What is characteristic is that students from different schools have opposing views on the same textbooks. For instance, regarding science textbooks (in accordance with the "Cambridge" programme), many students are critical and stress that:
"The new 'Cambridge' textbooks are incomprehensible".
"The lessons are too short and have too little data".
"They contain only texts, no formulas".

However, for other students, these textbooks are among the better ones:
"The most interesting textbook is the one for physics. It has many experiments, pictures, texts with explanations below the pictures. Also, the biology textbook has drawings, pictures."
"We learn the most from the physics and biology textbooks because they contain experiments and are very illustrative. That is knowledge that remains forever, I memorised it visually, unlike what I learn by heart that is only momentary knowledge. After the text I quickly forget it".

The same applies to other textbooks such as the history textbook, which is mentioned by students in one school as a good textbook because *"it has a lot of information, and a lot can be learned from it"*, whereas in another school the same textbook is pointed out as inadequate because *"the lessons are too long, they continue for three or four pages, and they are difficult to remember as there are too many facts and data"*.

The fact that there are different views on the same textbooks, apart from the fact that it probably depends on students' personal interests, also suggests that, probably, the teacher is the key medium who "serves" and adjusts textbook contents to students. This conclusion is also reflected in the words of one female student whose favourite subject is biology "*because the teacher explains well the material and it is easier for us to understand*". However, the findings that there are opposing views about some textbooks also indicate that there is a need of an additional analysis of the quality of textbooks used, and of the manner in which different teachers bring textbook contents closer to students.

2. *Use of ICT in the teaching process*

One of the main factors that seem important in relation to student achievement is the **frequency and ways of using ICT in the teaching process.** Therefore, one policy intended to increase the use of ICT in the teaching process in Macedonia was the measure for using ICT in the teaching practice in 33 percent of classes; and the project "Computer for Every Child" was implemented to that end. However, these two types of policies are not necessarily complementary given that the number of computers per student as an indicator is usually negatively associated with student achievement (OECDb). This means that ICT availability, per se, does also mean appropriate use of this technology for attaining the curriculum objectives, which is also confirmed by the regression analysis results.

Teacher answers leave the impression that most of them (80 percent) use ICT at least once a week. However, the frequency of ICT use is not associated with the school's technical equipment satisfaction. Therefore, given that more than a half of the teachers (62.5 percent) are only partially satisfied with the technical equipment of their schools, while 15.7 percent are not at all satisfied, a dilemma arises as to how they conduct one third of the classes by using ICT.

Students' answers give a different picture concerning the use of ICT in the teaching process and bring into question teachers' answers relating to the use of ICT in their lessons. Nevertheless, there are great differences depending on the school where students come from.[9] In a small number of schools, students indicate that they frequently use computers (one to three times a week), particularly in specific subjects (usually - science), students research contents on the Internet, make presentations, do exercises from specific web pages etc. On the other hand, in a larger percentage of surveyed schools, computers are almost not used in any way in the teaching and learning process, except for conducting the external testing. Students indicate that computers are broken and there is not a sufficient number of functional computers to be used on classes, except in the computer science class. (*"We do not have enough computers. Those we have are broken, and when something malfunctions, we are required to pay the damage:"; "Computers are fixed only before the external testing and then they are down again"*.)

Although schools have different practice concerning the frequency and way of using ICT, students are unanimously expressing the need of ICT use in the teaching process. When asked about the characteristics of their ideal school, *inter alia*, students said they would like to learn in schools with modern equipment, classrooms and cabinets with technology, computers, smart boards, and LCD-projectors.

[9] Not related to the type of school - urban or rural.

3. *Views on the discipline in class*

All examinations included in PISA results refer to the fact that discipline in class has a particularly strong association with student achievement. Although it is complex to determine this element of the teaching process through indirect methods (self-assessment), it was nevertheless checked through some of the questions.

Teachers, in general, perceive discipline as a necessary element in the teaching process by expressing strong agreement regarding the view that "quiet atmosphere in the classroom is necessary for effective learning" (77.4 percent agree). Personal assessments of teachers concerning the time during classes used for maintaining discipline indicates that a relatively small portion of the class is spent for this purpose. Specifically, on average, 11 percent (or four minutes) of the class duration is used for maintaining discipline, 13 percent for administrative work, while the largest portion of the class (73 percent on average) is used for conducting the teaching process. Class teachers spend more time maintaining discipline in the classroom compared to subject teachers[10], whereas the latter dedicate more time instructing and working on the material. These results were expected having regard to greater scope of contents to be adopted in subject teaching. However, what could be further investigated is whether students in the subject teaching are more disciplined than those in class teaching or, because the material in the subject teaching process is more extensive, teachers do not have that much time to spend maintaining discipline.

What is somewhat surprising is that, despite the importance that teachers place to discipline, the majority of them mentioned that parents are not very interested in student discipline (68 percent disagree or partially agree with the view that "parents are very interested in student discipline").

Students, in general, agree with teachers that they are able to learn a lot better on those classes where there is discipline, order, peace and quiet. ("*If there is peace and quiet in the classroom, it is easier to learn the material and to remember the lesson*".) However, they believe that discipline does not depend on students only, but also on teachers, who should be able to make the lessons interesting so that students are disciplined in class ("*Classes should be interesting, we should conduct more experiments, tests, so that we are disciplined*").

According to the students, the classes with the highest discipline are those of the stricter teachers ("*We fear those teachers because they are stricter, and so we are much more disciplined on those classes*".). On the other hand, the least disciplined are those classes held by younger, more inexperienced and more lenient teachers.

[10] Class teachers (M =11.6, SD=99), subject teachers (M = 9.2, SD=8.7), t=1.892, p=0.06

4. Views on learning motivation

Learning motivation (specifically, orientation towards objectives for learning and intrinsic motivation), according to different surveys, has been identified as one of the most significant factors associated with high performance (Covington, 2000). However, teachers often feel insufficiently ready and trained in techniques for stimulating student motivation. In addition, teachers believe they lack parents' support in stimulating intrinsic motivation in students given that the majority of them (almost 70 percent) think that "parents attach more importance to grades than to students' knowledge".

This reinforces student answers indicating the **predominance of instrumental learning motivation**. Specifically, they are primarily motivated to get high grades as an instrument for attaining other goals such as responding to parents' pressures and to the desire of making their parents happy and proud, but also for enrolment in secondary school. "Pressured" by the demands for high grades by their teachers and parents, students do not have much room to focus on knowledge per se, although they are aware of its importance. (*"We are aware that knowledge is more important than grades, but my parents care about the grade, and so that matters to me too"*.)

However, students are aware that expecting them to have high grades in all subjects is unrealistic because they are not interested in each and every subject; hence, they lack intrinsic motivation to dedicate themselves to each subject equally. (*"Our parents force us to study, that is why. But it is really difficult for me to get straight 'As' because I do not find all subjects interesting"*.)

Given such parents' expectations, it comes as no surprise that the majority of surveyed students indicated they study for grades ("*Rarely does someone study because that is interesting; the ambitious and curious students are very rare*."), which makes them quickly forget what they have learned ("*I study so that I get the best grade possible, but I quickly forget the things I have learned*".).

Students indicating that knowledge per se is also important for them and not grades only are rare ("*I want to learn for myself, to have knowledge, but I also want to have good grades*".). Some of the students emphasised that they study for knowledge only if the subject, or the curriculum material is particularly interesting, which incites their intrinsic motivation ("*There has to be something that really attracts you to make you study for knowledge*".). Given that, according to the regression analysis, students in Macedonia expressing a lower level of intrinsic motivation are those who achieved lower results in PISA 2015, the generally low level of this type of motivation in students is not surprising. However, this should be worrisome, especially in the context of the

new educational trends emphasising the need for schools to develop a motivation for lifelong learning.

In addition, appropriate and proactive communication between teachers and students is an important factor in stimulating interest and student motivation to actively participate in classes, to be motivated to improve their knowledge and proficiency. Namely, as an additional factor impacting motivation, students also emphasised the manner in which the teacher instructs and believe that the teacher can have an important role in their motivation to study, even in those cases where the curriculum subject is not particularly interesting to them ("*Sometimes the subject may be good, but the teacher not*".).

On the other hand, teachers' answers show that the use of traditional teaching methods is predominant: oral lectures, homework, and examination for the material learned. There is a much smaller percentage of methods departing from the traditional frameworks and stimulating a critical approach and creative activity in students, such as simulations, quizzes, debates etc.

What is worrisome are students' comments that some of the teachers do not pay enough attention to underperforming students, they just (automatically) give them the same grades from the sixth grade, and they insult these students before the entire class. But, also, a large portion of students mentioned that there are teachers motivated to help them, whom they can always ask if there is anything unclear or if they have some difficulties with the material. "*With most teachers I can openly say if something is not clear to me or if there is something I cannot understand…*", was reported by one female student.

When asked about their vision of the ideal school, students emphasised they want to have teachers who will be more friendly to them, with whom they could communicate more easily and more freely and will be able to confide in them, and students believe that in this way they will be more motivated to study.

5. Views on the time spent studying and the help / support in studying

The analysis of factors impacting the achievement in PISA testing indicated that time spent studying in the lowest-performing countries is positively associated with the scores. In Macedonia, the Bureau for Development of Education has developed Guidelines for Homework, according to which "recommended minutes per day for completing homework vis-à-vis student age are: first period 10-30 minutes, second period 30-90 minutes, third period 50-120 minutes. Hence, time for doing homework shall not last more than one hour in class teaching, and one to two hours in subject teaching." (BDE, 2013)

Student answers relating to the time spent studying at home (including homework) indicate that there are vast individual differences between them, from students who do not study on a daily basis at all, to students spending three hours studying per day. However, in general, the typical time spent doing homework is 60-90 minutes per day, which is in line with the recommendations of BDE.

But, students emphasise that in days before testing or written assignments, they might spend one hour to a whole night (three-four hours) studying. The time depends on the type of knowledge assessment. ("*If we have essay questions that the teacher announced or told them to us, we study around 1.5 to 2 hours.*"; *"If we are not told the questions, and we need to learn entire lessons, then we study around three to four hours.*").

Given that a significant portion of students have difficulties mastering the material, they first seek help from teachers, but when they cannot get it, they usually turn to members of the family who could help them. However, generally, they agree that not all parents are ready to help them in the studying because there are contents that not even the parents know. ("*It depends on the subject. They cannot help in all subjects"*.). Consequently, for specific subjects (usually mathematics and science) some students also hire tutors / attend private classes. ("*We cannot understand everything in class, for instance, in physics I have to attend private classes so I can understand the lesson - I do not sufficiently get it in school*".)

Since, according to the analyses on the association between time spent studying and achievement, out-of-school study time is considered as a compensation for what is not learned at school, it can be concluded that a significant portion of students fail to adopt the science course content during regular classes. Therefore, regular and appropriate practice of additional instruction and different forms of student tutoring is particularly important.

However, although MES has developed a Programme for Tutoring in Primary Education (MES, 2016) according to which students may be hired as tutors of students needing free additional lessons, the application of this practice was not mentioned by students. Only one of the schools mentioned that the teacher hires students who have more knowledge to help those experiencing difficulties.

For students that cannot master the material during classes, the Law on Primary Education provides for additional instruction to be organised "for students showing continuously poor results in the studying". ("Official Gazette of RM" No.103/08, Article 27). On the other hand, supplementary instruction "is organised for students achieving significant results in individual subjects (talented students). The teacher is obliged to offer supplementary instruction (...) to students, and students decide whether they will attend the supplementary instruction". ("Official Gazette of RM" No. 103/08, Article 28) The State Educational Inspectorate, among other

indicators, assesses the level of planning and implementation of the additional and supplementary instruction by teachers. (SEI/MES, 2009)

The teachers' survey indicates that they are almost unanimous concerning the importance of the additional and supplementary instruction. Namely, the majority confirm that "supplementary instruction enables the development of student potential" and "supplementary instruction refers to the use of additional literature". Regarding additional instruction, the majority agree that "it is adjusted to student needs" and that "it helps in improving their achievement". A slightly smaller number of teachers agree with the claim that "additional instruction stimulates interest in the subject", which suggest that although the implementation of additional instruction is expected to increase achievement, it is not expected to increase student motivation.

Students have experience in both types of instruction, although more in additional instruction. However, the implementation mostly varies depending on the school from which they come. The majority report that additional instruction is conducted once a month, and only students from one school reported that this type of instruction is conducted once or twice a week. It is sometimes conducted at the request of students, and sometimes at the request of teachers. These classes are used for (1) repeating the lesson; (2) for further explanation of some aspects from the regular class; (3) for allowing teachers to "further examine" students; and (4) for correcting grades. However, not all teachers apply this form of instruction and some even avoid it.

6. Views on teacher co-operation and professional development

The need of continuous professional development of teachers is an already recognised fact by our educational institutions as well. The imperative that teachers should undergo professional development is also prescribed in the Law on Teachers ("Official Gazette of RM" No.127/16; Article 19, Article 21). Therefore, in the last decade, the competent educational institutions - MES and BDE (co)organised many trainings for professional development of teachers and for improvement of their competencies.

Consequently, it was not surprising that from the teachers surveyed, 81 percent reported they attended trainings / workshops for a particular subject or for teaching methods and techniques, or on topics relating to education in the last three years. There are also a considerable percentage of teachers (40 percent) who attended qualification programmes (postgraduate or doctoral) and participated in conferences or seminars related to topics and issues from the area of education (39 percent). As regards the methods allowing for more practical ways of professional co-operation and exchange of experience, every third teacher reported being involved in professional networks, but a relatively small share participated in study visits to other schools (12.6) or mentorship (21 percent).

Given that most of the trainings conducted are (directly or indirectly) related to teaching methods, the question arises whether teachers who have attended trainings apply more often teaching methods stimulating critical thinking. The correlation between the two variables indicates that there is a positive relationship between attending trainings and using this type of methods in the teaching process (r=0.185, p=0.003), which suggests that competencies acquired at trainings are applied in teachers' everyday practice. However, the findings should also be evaluated by other methods, since it is possible that teachers who attended more trainings have "overestimated" the use of modern teaching techniques because of the awareness of their importance and the desire to show themselves in a socially favourable light.

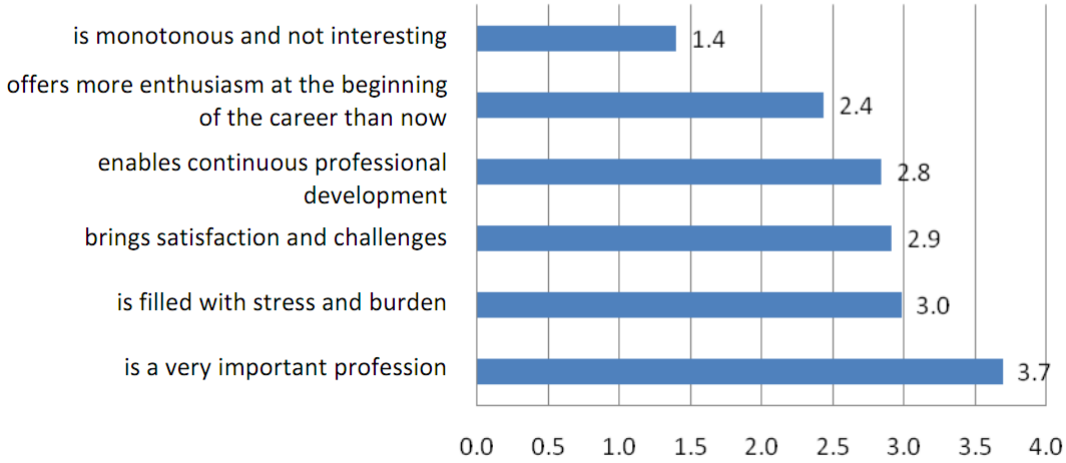
The analysis of the question about different aspects of teacher work leads to the conclusion that teachers are most satisfied with the co-operation with expert services (whole 73.7 percent reported being very satisfied), they also reported a high percentage of satisfaction with the co-operation with school management (70.5 percent), but there is also a relatively high percentage of satisfaction with colleague-to-colleague cooperation in schools. Teachers are least satisfied with parents' co-operation, i.e. more than a half of teachers (58.4 percent) reported they are partially satisfied with this aspect of their work.

7. *Views of the teacher profession and agency*

Besides many external factors (adequate valuation of teacher work, achievements, working conditions etc.) affecting the opinion, view, attitude of teachers to their own profession, a very important factor for the implementation of quality teaching is teachers' intrinsic motivation and their attitude to the profession.

From teachers' answers in the survey conducted within this research concerning the teacher profession and the possibilities and challenges it brings to the profession, it can be concluded that almost everyone unanimously believes that the profession is particularly important (M=3.7, SD=0.65). Also, what is relevant is the strong agreement that the profession brings satisfaction and challenges, but it also allows for professional development. However, despite the reported positive characteristics, surveyed teachers have a tendency to agree with the view that their profession is filled with stress and burden (M=3.0, SD=0.91) (see Chart 7). Teachers are almost divided in their opinions as to whether they had more enthusiasm at the beginning of their careers or later, i.e. some believe their enthusiasm for the profession was greater at the beginning, and some partially agree or do not agree with this claim.

Chart 7. Views of the teacher profession
"The teacher profession…"



* Note: The chart shows the mean values from teacher answers to questions in a four-point scale (1 - strongly disagree; 4 - strongly agree)

Regarding their profession, it is evident that teachers with longer work experience more strongly agree with the view that the teacher profession is monotonous (r=0.129, p=0.02), and that it is not so important (r=-0.161, p=0.01). Perhaps this is due to their professional burnout, which leads to a decrease in enthusiasm and feeling of agency. This is also confirmed by the regression analysis, which indicates that younger male and female teachers have reported in a smaller

percentage that the teacher profession is filled with stress. On the other hand, the longer the experience in this profession, the higher the perception that it is filled with stress.[11]

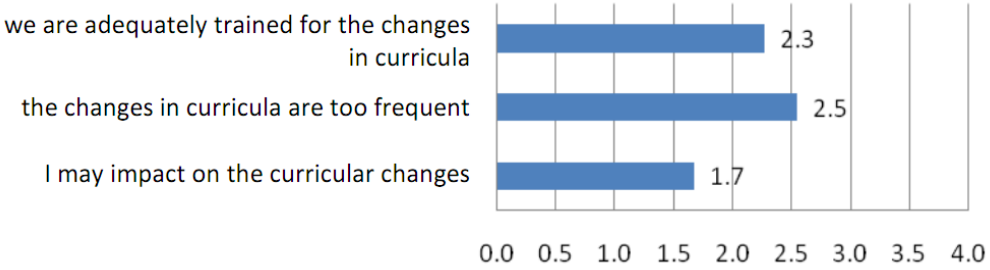
Regarding the connection between views of the profession and application of traditional versus modern teaching methods, the results from the statistical regression indicate that modern methods are used more by those teachers who believe that (1) the teacher profession offers possibilities for development and progress (r=0.203, p=. 0.02), (2) brings satisfaction and challenges (r=0.84, p=0.01), (3) their work is important (r=0.192, p=0.02), but also those who (4) believe the profession is filled with stress (r=0.206, p=0.02). Although statistically insignificant, nevertheless, there is a negative correlation between the use of modern teaching methods and views that (1) the teacher profession is monotonous and (2) that over time the initial enthusiasm of the profession dampens. This indicator is worthy of further investigation because it indicates the negative relationship between methods important for creative and critical thinking of students and negative attitude to teachers' own profession.

In addition to the views of their own profession, teachers' involvement in the changes of curricula, adequate training on the newly introduced programmes, and continuous consultation and surveying of teachers' opinions on the planned changes to the curricula, teaching methods etc. is of vital importance for improving the quality of teaching, and for improving all other aspects of the educational process. However, despite the general satisfaction with the profession and the possibilities it offers, teachers report a relatively low level of agency showing a tendency to disagree on the possibility to impact the changes in curricula, although they have a tendency to agree that the curricula change too often.

[11] The model has R2=0.059, F=3.710, p=0.03

Namely, the majority of teachers (completely or partially) agree that the curriculum changes are too often (83.8 percent), while only 15.3 percent reported that they directly disagree with this view. What is problematic is that frequent change in curricula is not accompanied by appropriate training of teachers, which is evident from the low tendency to agree with the following view: "we are appropriately trained for the curriculum changes") (Chart 8). This leads to the conclusion that those directly implementing the curricula are almost not involved / consulted in their development and changes. Therefore, it is to be expected that the insufficient feeling of "ownership" of the new policy will lead to its incomplete and inadequate implementation.

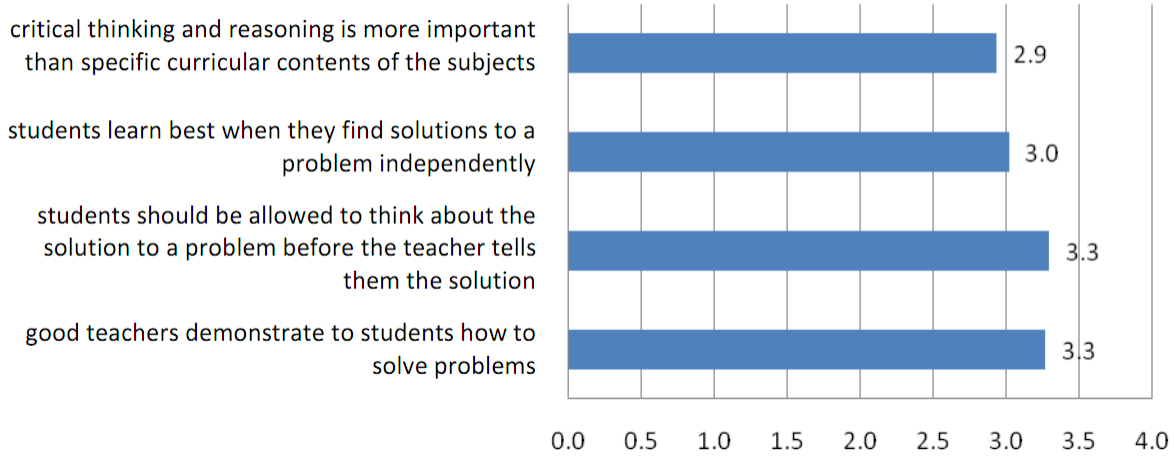
Chart 8. Views of agency
"Regarding decision making and decision effects..."



* Note: The chart shows the mean values from teacher answers to questions in a four-point scale (1 - strongly disagree; 4 - strongly agree)

Regarding the possibility to impact, teachers from urban environments feel they have a greater impact on changes in the curricula compared to those from rural schools (r=-0,200; p=0.02), which suggests that even when consultations are held, they are not sufficiently inclusive. Surprisingly, teachers with more years of work experience in the profession feel to a lesser degree they could impact the changes in curricula (r=-0.236; p=0.00). Perhaps this is due to the personal experience of teachers with a longer length of service who have not been consulted so far in the implementation of changes, while younger teachers still have enthusiasm and optimism regarding their role as policy makers.

Chart 9. Views of teaching and learning



* Note: The chart shows the mean values from teacher answers to questions in a four-point scale (1 - strongly disagree; 4 - strongly agree)

Regarding teachers' views about learning and teaching, there is a relatively strong agreement in terms of all offered views (Chart 9). What is interesting is the correlation between the views of two claims, which are essentially opposing claims ("good teachers demonstrate to students how to solve problems" and "students learn best when they find the solution to a problem independently"). The reason is perhaps the inability of teachers to determine the difference between the two claims, or the view that the two claims equally apply, depending on the specific needs of the teaching process.

Probably, due to the low variation in answers, a connection has not been identified between the use of modern teaching methods and teachers' views of what is important for learning and teaching. Regarding the association between the views about learning and teaching and the methods of teaching, there is a positive association between self-assessment and the view that it is good for students to think for themselves before teachers provide them with the solution to a problem ($r=0.129$, $p=0.01$). This means that teachers who believe that students need to think by themselves about problem solutions use more frequently the method of self-assessment as a way of evaluating students' knowledge.

CONCLUSION

Findings from the analysis of PISA testing results confirm that student achievement is associated with different indicators, directly or indirectly linked to the teaching process. Specifically, the results confirmed the importance of the method for science instruction and teachers' readiness to apply different types of approach for mastering the material. It could be concluded that applying methods of discussion, debate and similar methods stimulating the development of critical thinking leads to better student performance. Nevertheless, the results also refer to the fact that teachers need to be careful when using experiments and enquiry-based methods in the teaching process, because their inadequate application may adversely affect student achievement. Namely, it is not enough that students witness the experiment; they have to understand why the experiment is conducted, to extrapolate conclusions from the procedure and to be able to discuss the results.

In addition, data confirms the importance of maintaining high learning motivation, and also of maintaining discipline during classes. Discipline does not mean that students should be passive during instruction, rather, that they need to be focused on the course content that will attract their interest and will encourage them to participate with their own questions, comments, suggestions; without worrying that they will be criticised for their opinions.

At the same time, the analysis indicates that a very small percentage of Macedonian students have developed competencies and knowledge on the three levels being measured in the PISA testing, and they are considerably below the international average. Specifically, one in four students in Macedonia has competencies required for understanding, application and evaluation of scientific enquiry. This data shows that the education system insufficiently develops critical thinking and scientific approach in students' review of information. Students do not perceive course contents as adequately related to everyday life or applicable.

Probably, because of the above mentioned reasons, student motivation is mostly instrumental and almost all agree that they study for grades, because parents show greater interest in the grades they get than in the knowledge they acquire in school. However, in those cases when the teacher is particularly engaged in making the class more interesting and learning essential to students' life – students do not lack interest.

This leads to the conclusion that in order to improve science literacy of students, the education system in the country should undergo changes that would be aimed at improving students' motivation and their interest in science concepts. That requires use of teaching methods and techniques, and different activities that will be interesting to students and will be perceived as adequate, and which at the same time will enable the development of critical thinking.

However, this is not the practice of our education system. Although the majority of teachers were involved in different forms of professional development and have an opportunity to choose different methods and techniques for teaching and assessment; nevertheless, they still predominantly use traditional methods of instruction, where the teacher is the one who transfers knowledge and the students are recipients; and assessment where the teacher is the one who evaluates student achievement. ICT is not sufficiently used for instruction and learning, so the dilemma arises as to how the envisaged 33 percent of classes with ICT are implemented when the schools are insufficiently equipped with computers and other technical devices.

In addition, besides the curriculum objectives that include acquiring of competencies on different levels according to Bloom's Taxonomy[12], teachers usually expect students to reproduce knowledge. Therefore, given that students will learn in the same way as teachers assess them, it should not come as a surprise that students' focus is on learning based on memorising and reproduction of data, and conformity with teachers' views, instead of developing a critical and creative thinking.

The analysis of results from the field survey show that teachers, in general, have a positive attitude to their profession, they believe it brings challenges and satisfaction, and possibilities for professional and career development; but, on the other hand, many teachers view their teaching profession as stressful and demanding. Teachers are most critical about the possibility to impact curriculum reforms. It can be concluded that they are practically not involved and consulted on the changes in the education system and in the curricula, which they directly implement or are affected by their changes. What is particularly worrying is that less than half of the teachers believe they are adequately trained for implementation of the new programmes.

There is an evident lack of appropriate and essential co-operation with parents and their involvement as more active factors in the learning process, and not only as recipients of information about their children's performance (i.e. grades). This type of co-operation is particularly important for reducing the impact of students' socio-economic status on their educational results.

12 http://teaching.uncc.edu/sites/teaching.uncc.edu/files/media/files/file/GoalsAndObjectives/BloomWritingObjectives.pdf

RECOMMENDATIONS

General recommendations on the objectives of the education system

- *The education system should develop critical thinking and enquiry-based approach to students' review of information.* At the same time, it should stimulate students' achievement motivation, develop their interest in a scientific approach to phenomena and develop their self-efficacy and awareness of the environment.

- In the development of educational reforms, attention should be paid to make sure they are directed towards developing intrinsic motivation for learning, i.e. "learning for knowledge" versus "learning for grades".

- In addition, the education system should enable *effective and efficient use of time spent in school.* Classes should be held in a relaxed working atmosphere, where students feel free to ask questions and to voice their opinion. However, there should be appropriate discipline in class and all students should focus on mastering the material.

- Education policy should ensure *conditions and support for all students in achieving the baseline knowledge* regardless of their origin and socio-economic status.

Recommendations for MES and institutions within MES

- *The curricula should be revised*. They should pay attention to the volume of envisaged material and to the link between the curriculum contents and objectives. Objectives defined in the programmes should be linked not only to specific knowledge, but also to competencies that will prepare students for further education and knowledge application in everyday life. Curricula should also contain aspects of their adjustment to the different educational needs of students.

- Textbooks should be analysed to see if the contents are linked with the objectives defined in the curricula. In this context, teachers need additional materials, which could be used for attaining the curriculum objectives and for adjusting the contents to the different educational needs of students.

- Teachers need additional trainings from different areas in order to improve the teaching process and thus increase student achievement. Specifically, they need:

1. Detailed and practical training on the curricula they implement. Adequate training of teachers is the starting point for quality teaching, and the small percentage of teachers who believe they are adequately trained indicates that additional trainings are needed for better implementation of curricula.

2. *Psychological readiness and strengthening the skills for motivating students.* In this context, teachers need training on how to use different teaching and assessment methods so as to stimulate student motivation for learning and developing lifelong learning competencies.
3. *Teachers' sensitization to the consequences from professional burnout* and *mechanisms for overcoming professional burnout* so as to increase satisfaction, positive energy and will to work, but also the sense of fulfilment from their work.
4. *Subject teachers should receive additional trainings and expert and collegial support in using modern teaching methods.*

In addition, trainings should be accompanied by continuous expert and mentorship support to teachers by BDE, and to expert services within schools, with the purpose of maintaining the effects.

- The method of using ICT in the teaching process should be redefined, without insisting on its use in one third of the classes; instead, the method of using ICT should be aimed at learning and development of student competencies. The use of ICT in the teaching process should be well-structured and rational, and more attention should be paid to providing equal opportunities to all students for mastering the material through different teaching methods and techniques, instead of insisting on the use of ICT in the teaching process at all cost.

- The *teaching staff should be more involved in the education policy making process* and they should participate in the decision making concerning innovations in the teaching process. The involvement levels may range from assessment of the perceptions and views regarding a given policy through surveys, organising discussions / debates with the teaching staff, and participation in working groups (on local and national level) for adoption of a specific policy. In parallel, attention should be paid to include teachers from different environments and with different experience regarding the structure of students with whom they work.

- In the context of insufficient co-operation detected between different factors in the education system, it is necessary to have *joint discussions involving teachers (school staff), parents and students, which would help locating the critical points where there is a discrepancy between the mutual expectations and responsibility.*

Recommendations for schools

- *The processes of adopting curriculum contents should be adjusted to student needs.* They should provide students with clear information transferred in a comprehensible manner. During classes, methods should be used stimulating discussions, development of concepts and ideas; visualisation means for demonstrating the functioning of natural phenomena; and to establish a continuous evaluation as to whether and to what extent have students understood the material. Teaching methods should also encourage critical thinking and connecting information to real life, and the assessment methods should evaluate the acquired competencies for critical and creative thinking.

- Students' *time spent at school should be filled with activities that will help them master the material*, so that students would not be overburdened in out-of-school learning of the material. This means that the structure of material and classes should be adjusted so that students receive applicable information at school, which would enable them to use their out-of-school time for informal education.

- Schools should be *more engaged in organising and holding additional and supplementary instruction*, and to develop forms of tutoring between students. Students should perceive these classes as interesting and important, which would increase their interest to participate. At the same time, this type of instruction may provide additional support to students at risk of becoming low achievers so that equal opportunities are provided to all students. In addition, greater importance should be placed on supplementary instruction, which is seldom applied, and so gifted and talented children very often do not get the necessary support for further development of their abilities.

- On both school and regional level, *forms of co-operation between teachers should be activated* (learning groups / teams), which will be intended for exchange of experience and good practice, and for providing assistance and support in the implementation of contents.

- Parents' participation as active factors in the education of their children should be reinforced through their greater involvement in the participation forms at school level (e.g. parent councils). In addition, it is also recommended to develop new models of co-operation, through which parents will be able to get closely familiar with the objectives of the educational process and to act as a support mechanism to their children in co-operation with the teachers.

REFERENCES

Bailey, M. and Borooah, V.K. (2010) What enhances mathematical ability? A cross country analysis based on test-scores of 15 year olds. *Applied Economics*, 42, p. 3723-3733.

Bureau for Development of Education (2013) Guidelines on the Method and Form of Preparing, Planning, Giving, Completing and Monitoring Homework for Students in Primary Education.

Bureau for Development of Education (2015) Formative Assessment in Classroom Teaching: Manual.

Covington, M.V. (2000) Goal Theory, Motivation and School Achievement: An Integrative Review. *Annual Review of Psychology, 51, p. 171–200.*

Fuchs, T. and Woessmann, L. (2004) What accounts for international differences in student performance? A reexamination using PISA data, *CESifo Working Paper no 1235.*

Grek, S. (2009) Governing by Numbers: The PISA 'Effect' in Europe. *Journal of Education Policy, 24 (1), p. 23-37.*

Guzel, G and Berberoglu, G. (2005) Analysis of PISA 2000 mathematical literacy data for Brazilian, Japanese and Norwegian students. *Studies in Educational evaluation, 31, p. 283-314.*

Hampden-Thomson, G. and Bennett, J. (2013) Science teaching and learning activities and students' engagement in science. *International Journal of Science Education, 35 (8), p. 1325-1343.*

IEA (2005) Progress in International Reading Literacy Study (PIRLS) 2006: Teacher Questionnaire.

Leathwood, C. and Archer, L. (2004) Social class and educational inequalities: the local and the global. *Pedagogy, Culture and Society, 12 (1), p. 5-13.*

Lee, J. (2009) Universals and specifics of math-concept, math self- efficacy and math anxiety across 41 PISA 2003 participating countries. *Learning and Individual Differences, 19, p. 355-365.*

Logan, M.R. and Skamp, K.R. (2013) The impact of teachers and their science teaching on students' 'science interest': a four-year study. *International Journal of Science Education, 35 (17), p. 2879-2904.*

Lucas, S.R. (2001) Effectively maintained inequality; Education transitions, track mobility and social background effects. *The American Journal of Sociology, 106 (6), p. 1642-1690.*

Ministry of Education and Science of the Republic of Macedonia (2016) Programme for Providing Tutoring to Students in Primary Education.

Oakes, J., Jospeh, R. and Muir, K. (2004) Access and achievement in mathematics and science: Inequalities that endure and change in J.A. Banks and C.A.M. Banks (Eds) *Handbook of Research on Multicultural Education* (2nd edition). San Francisco: Jossey-Bass.

OECD (2009). PISA Data Analysis Manual SPSS Second Edition. OECD Publishing, Paris.

OECD (2013) Teaching and Learning International Survey (TALIS): Teacher Questionnaire. OECD Publishing, Paris.

OECD (2015) Students, Computers and Learning: Making the Connection. OECD Publishing, Paris.

OECD (2016) PISA 2015 Background Questionnaires: Teacher Questionnaire" in PISA 2015 Assessment and Analytical Framework: Science, Reading, Mathematic and Financial Literacy. OECD Publishing, Paris.

OECD (2016a) PISA 2015 Results (Volume I): Excellence and Equity in Education. OECD Publishing, Paris.

OECD (2016b) PISA 2015 Results (Volume II): Policies and Practices for Successful Schools. OECD Publishing, Paris.

OECD (2016c). PISA 2015 Assessment and Analytical Framework: Science, Reading, Mathematic and Financial Literacy. OECD Publishing, Paris.
OECD (2017) PISA 2015 Results (Volume III): Student's Well-Being. OECD Publishing, Paris.

Official Gazette of the Republic of Macedonia 103/08 (2008) Law on Primary Education.

Official Gazette of the Republic of Macedonia 127/16 (2016) Law on Teachers in Primary and Secondary Schools. Consolidated text.

Schleiher, A. (2007) Can competencies assessed by PISA be considered the fundamental school knowledge 15-year-olds should posses? *Journal of Educational Change, 8, p. 349-357.*

State Educational Inspectorate (2009) Indicators for Schools' Quality of Work.

University of Michigan, Survey Services Lab (2001) The Study of Instructional improvement: Teacher Questionnaire, 2000-2001.

University of North Carolina, The Center for Teaching and Learning. Division of Academic Affairs (2004) Writing Objectives Using Bloom's Taxonomy.

Valijarvi, J., Linnakula, P., Kupari, P., Reinikainen, P. and Arffman, I. (2000) The Finnish success in PISA - and some reasons behind it. OECD.

Photo credits: Freepik, Pixbay

Policy study 9 :

FROM NUMBERS TO PRACTICE – IDENTIFICATION AND ANALYSIS OF THE INDICATORS RELATED TO THE QUALITY OF THE TEACHING PROCESS IN THE PRIMARY EDUCATION IN MACEDONIA