

ANALYSIS: The Advantages of Application of TIMSS (Trends in International Mathematics and Science Studies) on Educational System of Bosnia and Herzegovina

Prepared by: Centre for Policy and Governance

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Introduction

To improve the quality of educational system, most countries worldwide participate (more than 60 countries in 2011) in testing of various relevant fields aimed at students of fourth and eighth grades of elementary schools. The internationally standardized tests – PIRLS (Progress in International Reading Literacy Study) and TIMSS (Trends in International Mathematics and Science Study) – are utilized to assess students' ability to understand content designated by the curriculum and to practically apply adopted knowledge in relevant fields.

Indirectly, TIMSS monitors teaching methods, its quality, the quality of textbooks content, as well as results of additional teachers' training. Comprehensive analysis of the information coming out of this testing enables each country to identify potential weaknesses within the system and make appropriate changes.

This paper examines and analyzes the opportunities of TIMSS application to educational system of Bosnia and Herzegovina (primary and secondary education) with special focus on higher quality and standards including the importance of participation in the international test in general.

In 2007, Bosnia and Herzegovina participated in TIMSS testing for the first time.

Inter-entity Agency for Standards and Evaluation in Education in Federation of BiH and Republic of Srpska (presently Agency for Pre-Primary, Primary and Secondary Education BiH/Agencija za predškolsko, osnovno i srednje obrazovanje BiH (hereinafter APOSO)) was in charge of organization and implementation of the entire process.

In 2007, mathematics and natural sciences knowledge of 4,300 pupils from 150 schools was examined. According to the Agency for Statistics of Bosnia and Herzegovina this is around 10 percent of total number of primary schools in the entire country. Testing also indirectly assessed 150 school Principals and 724 Teachers. The final results showed that the BiH was ranked 27th out of 50 countries. The points achieved (465.5 points) indicate that the country position itself as low or medium quality education system, since the international average score is 500 points.

The results show that only 10% of pupils have the ability to apply acquired skills and knowledge in mathematics, whereas 14% of them show the same skills in natural sciences. Furthermore, only 32% of students have satisfactory level of knowledge in mathematics, while 46% of students have equally adequate understanding of natural sciences. These results are not satisfactory, but they can be used as baseline for improvement of educational system overall.

The preparation and execution of the entire TIMSS process takes about two years. Prior to official testing, the pilot testing takes place treating different sample of students. Schools/students are selected based on statistical model determined by National Center for Education Statistics in Canada, while the criteria of selection are established by APOSO. The criteria include samples from Entities, Cantons, Brcko District (the Federation of Bosnia and Herzegovina – The Republic of Srpska, ratio 2:1). The number of samples is the same in every country.

The National Coordinator for TIMSS is representative of the Agency for Pre-Primary, Primary and Secondary Education BiH responsible for the entire process. Lower level Ministries provide administrative support as partners in the process of implementation of TIMSS.

When it comes to quality of education system, which improvements, based on TIMSS results and conclusions, can be achieved?

After conducting TIMSS 2007, APOSO has undertaken secondary analysis that serves as the basis to the Ministries of education for revision of the curriculum, introduction of system changes, the implementation of reforms etc. Many schools received the secondary analysis along with test tasks (secondary analysis did not include all tasks, because the complete content of tests is not public). This gave an opportunity to Teachers to include test tasks in their further teaching practice.

In 2011 APOSO intended to conduct TIMSS, so they have defined test samples and prepared translations, but due to lack of financial framework the examination was not accomplished. According to information from the APOSO, former and potential donors were not able to provide full financial support but they offered to cover 80% of the funds, while domestic decision-makers were not willing to participate with the amount of 20% of total costs.

As stated by the Agency, there are two types of costs related to this process – the membership fee and internal or local costs of implementation. The annual membership fee for each country is in the amounts € 22,500 and \$ 22,500 (according to official data of IEA, 2011), which is about \$ 52,000. The internal costs include the costs of distribution, packaging, bookbinding, tester fees, marker fees, training costs, etc. The Agency could partially support the process by reorganization of its budget. However, it is necessary to long-standing and sustainable financial model for the entire process. In terms of costs, the Agency's forecast for 2011 was about \$ 60 000 for participating in TIMSS and PIRLS for 4th and 8th graders (in 2011 both TIMSS and PIRLS took place).

Since the BiH has participated in TIMSS in previous years, it would be easier to implement it once again than to start with a process of organization of some other standardized test. Continuity in TIMSS would also enable the monitoring and evaluation of changes and trends in achievements of teachers and students. By that we would track the effectiveness of education, previously implemented reforms and changes in the curriculum between two surveys in the period of four years. There is also a possibility to get translation of these tests from Croatia or Serbia, since in 2007 Bosnia and Herzegovina concede translation to Serbia, which they have slightly modified to fit their needs. According to APOSO it is possible to leave out the pilot testing for TIMSS 2015, but the BiH should as soon as possible register and start with organizational activities in the second half of 2014.

Regular testing should not be perceived as an expense but as an investment that will contribute to greater prosperity, growth and development of BiH. The global results of TIMSS suggest that countries whose students accomplished the best results are countries that achieved the highest economic growth and prosperity. Recommendations of the European Community on the introduction of standardized education system dates back to the Lisbon strategy, which states that education systems should foster students' achievements i.e. best

results in mathematics, reading and science (Explaining Student Performances, 2005). Further on, the recommendation implies that the average achievement of students with lower results needs to be improved, and in this case TIMSS would enable the measurement of these improvements.

The European Commission highlights the importance of the implementation of TIMSS through the European Strategy 2020. The document "Key data on teachers and school directors in Europe" (2010) states that TIMSS is one of the important parameters for quantifying the quality of education in the European Union and its future members. Therefore, the participation in TIMSS would be a step closer to meeting European standards.

Implementation of this testing on a regular basis also influence mobility of the future workforce. In particular, TIMSS serves as the correction means for the education system quality since its results and conclusions are basis for recommendations for the improvement of the curriculum and teaching methods. Also, this leads to improvement of standards and harmonization with EU principles. Former transitional countries such as Czech Republic, Hungary, Romania and Slovenia went through the same process in their integration to EU, so now their students are able to continue their education in any member state.

In the long run TIMSS provides equal opportunities for all, and equal access to knowledge for all students in BiH. Further on, systematic improvement and harmonization of quality of the curriculum requires regular participation in international tests. It is necessary to keep up with the world's educational trends, to continuously analyze the results of testing and to include them into the system.

Conclusions

Implementation of TIMSS contributes to the overall socio-economic research because it provides a clear picture which factors crucially affects students' achievements in each country, such as: entering the education system at early age – attending kindergarten, learning support both at home and at school, location of school, positive attitude towards learning and teachers/students relationship.

Even though, BiH in 2007 did not achieve high score, this study showed that educational system of the country has great potentials. To achieve those envisaged potentials it is necessary to introduce regular international test into practice and by that improve methodology and curriculum, because defects that occur in these two aspects directly affect the test results.

Regular conduction of TIMSS is necessary, because this kind of international testing enables continuous monitoring, comparison with other systems and it provides clear picture what has to be done. Also, this test display whether any improvements and progresses were made within relevant sectors in the certain period of time.

Recommendations

Since the Ministry of Civil Affairs of Bosnia and Herzegovina (hereinafter: MCP), through its Department of Education, cooperates and carries out activities agreed with international associations in the field of education, its role in planning and implementation of this project is crucial. Firstly, MCP should as soon as possible start initiative for execution of this process. They should provide clear instructions to the relevant Entity and Cantonal Ministries on how to support the process, bearing in mind the time frames for all necessary preparations. Furthermore, in order to establish a basis for the feasibility and sustainability of this testing, the Ministry should allocate funds for the costs of participation and implementation. This is the basic precondition for participation of Bosnia and Herzegovina in TIMSS 2015.

Once the BiH is officially registered, the Agency will appoint the National Coordinator, who will be the link between the IEA and the country. The Coordinator will be obliged to attend the meetings organized by the IEA (approximately two meetings before the test and two meetings after sending results). The National Coordinator will be educated for delivery of the process by the IEA. In preparatory phase, the Coordinator will transfer gained knowledge to all other individuals involved in the testing. In accordance with the recommendations, the Working Group would be formed with members from APOSO and the Ministry of Civil Affairs (Department of Education), led by the National Coordinator whose primary task will be to organize activities related to the preparation, monitor, control and manage the entire process.

Upon receiving the original tests, the Working Group would be in charge of translating, printing, copying and distributing tests to schools one day prior to testing where it will be deposited into safe. Prior to testing, National Coordinator holds three days training for Moderators and Markers so they can efficiently deliver their tasks. In order to keep costs low, the testing Moderators will be teachers from the selected schools. Examination takes two working days within one work week. Upon completion two thirds of tests are marked twice and one third of tests are marked once. Evaluated tests are sent to the IEA for analysis. Results are delivered after ten months. After that, Working Group should start with analysis of received data and creation of policy recommendations to improve all relevant segments of BiH education system.

In addition to this testing, there is a second level testing – TIMSS Advanced. This test examines the knowledge and competences, curriculum and learning process in high schools. In case of TIMSS Advanced introduction, the education system of Bosnia and Herzegovina would get complete overview of current situation, and a clear picture of progress in areas of mathematics and science. Thus, for that reason advanced testing yield benefits when graduating, enrolling in colleges and positioning on the labor market.

Research methodology – desk research and interview

Desk research materials:

„The Quality and Costs of Education in BiH“, Fund Open Society BiH, Author Lejla Dragnic, published in March 2013

„Key Data on Teachers and School Leaders in Europe“, European Commission 2013 (accessed July 4, 2013) http://eacea.ec.europa.eu/education/eurydice/documents/key_data_series/151EN.pdf

„Explaining Student Performance, Evidence from the international PISA, TIMSS and PIRLS surveys“, Danish Technological Institute, 2005 (accessed July 6, 2013) http://ec.europa.eu/education/more-information/doc/basic_en.pdf

Interview with Zaneta Dzumhur, National Coordinator TIMSS 2007 and Head of Department for Analyses and Statistics, APOSO
Interview conducted on 2 July, 2013

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