Chapter 8
International and National Assessments in Croatia

Michelle Braš Roth

This chapter refers to the monitoring and assessment of pupils' achievements in the Republic of Croatia, starting with a brief chronological review and describing some of the changes that have taken place in the education system over the last 25 years. For a decade, Croatia has been introducing new ways of external evaluation in education at the national level and has participated in several international studies to compare learning outcomes and the quality of the education system with other countries. During the first two decades of the twenty-first century, the quality of education and the constant monitoring of educational achievements has become imperative not only for teachers but also for employers and society as a whole. Teachers will necessarily have to change the teaching methods and have permanent training for new challenges in their profession, especially to meet the constant changes and needs of the labor market, to better prepare students for their first occupation or for continuing their education and taking their role of active citizens in a modern democratic society. Consequently, monitoring students' assessment and achievements becomes a generator of key changes in education systems and determines significant trends in the development of educational practice in the future.

Introduction to International and National Assessment Context and Its History in Croatia

Since the dissolution of the Yugoslav Federation during the 1990s, the Republic of Croatia, like the rest of the former socialist countries, has started the process of transition from communism to pluralist democracy, the free market, and the unification with the European Union. This also initiated changes in the educational system.

M. Braš Roth (✉)
National Centre for External Evaluation of Education, Zagreb, Croatia
e-mail: mbc_studio@yahoo.com

H. Harju-Luukkainen et al. (eds.), *Monitoring Student Achievement in the 21st Century*, https://doi.org/10.1007/978-3-030-38969-7_8

Unfortunately, at the beginning of this process, the country went through a defensive war that destroyed and damaged many industrial buildings, cultural, religious, and educational institutions and slowed the implementation of all planned reforms. The newly established government had to take care of hundreds of thousands of displaced persons and later refugees from Bosnia and Herzegovina, rebuild what was destroyed, create new democratic institutions and democratize society as a whole, privatize public and material assets, restructure the economy, and work on joining Euro-Atlantic integrations.

The Republic of Croatia entered the twenty-first century with an education system that had to be reformed, bearing in mind the Croatian and European context. It was necessary to plan the development of education according to European standards and design a system similar to those in developed European countries. This was supposed to contribute to the goal of shared living and sharing responsibilities in the united Europe and strive to take part in the creation of new European school models in the future.

Over the past two decades, much attention has been directed to the educational reform, but unfortunately, important and desired changes in structure and quality have not been achieved. There were three attempts to introduce a new concept between 1990 and mid-1999, when extensive reform was proposed. In 1991, a public tender for changes in the education system was opened; in 1993, the document "New Croatian School: General Concept of Education in the Republic of Croatia" was proposed, and in 1995 the Croatian Education Development Program was proposed.

From 1990 to 2000, there were various partial changes in the structure of the educational system and in the curriculum. The primary school curriculum was reformed to comply with the demands of a free and democratic society, rejecting ideology and adhering the principles of pluralism and modernization. About 180 vocational-educational centers were transformed into 399 secondary schools (grammar schools and 3- or 4-year vocational schools) with new curricula and syllabuses drawn up for all types of secondary schools and occupations. Furthermore, the dual system was introduced in crafts training, religious instruction became an elective subject, and information technology began to be introduced in schools, both in primary and secondary education.

In the period from 1990 to 2000, several laws were adopted to regulate the legal, financial, and organizational aspects of each subsystem (preschool, elementary, and secondary education). These legal changes have enabled educational pluralism such as opening of private and international schools and the introduction of alternative programs such as the Waldorf and Montessori schools. Furthermore, local communities started to cofinance primary and secondary schools, and local self-government bodies and parents gained a greater participation in the decision-making process. It also enabled an adequate education for national minorities as well as greater autonomy for schools and teachers.

In 2000, the Ministry of Education and Sports started a public debate on the Fundamentals of the Educational System in the Republic of Croatia, a document reflecting the government's educational reform program and placing education at

the focus of interest of the broadest professionals and wider public in Croatia. Croatia has opted for an education system similar to those in economically, scientifically, and technologically developed countries, but before reforms could be planned and implemented, Croatian education had to be analyzed from different aspects and compared with education in other countries.

Therefore, the National Center for External Evaluation of Education was established, which has immediately started with a series of activities in the field of measurement of educational outcomes at the national level. In addition, Croatia joined several international studies with the aim of monitoring pupils' achievements and the quality of the education system led by International Association for the Evaluation of Educational Achievement (IEA) and Organization for Economic Co-operation and Development (OECD):

- Programme for International Student Assessment (PISA 2006, PISA 2009, PISA 2012, PISA 2015, PISA 2018)
- European Survey on Language Competencies – ESLC (SURVEYLANG 2011)
- Progress in International Reading Literacy Study (PIRLS 2011)
- Trends in International Mathematics and Science Study (TIMSS 2011, TIMSS 2015, eTIMSS 2019)
- International Computer and Information Literacy Study (ICILS 2013)
- Teaching and Learning International Survey (TALIS 2013, TALIS 2018)
- International Civic and Citizenship Study (ICCS 2016)

Although the results did not receive much media coverage, many people were very much surprised with the outcomes. Participating schools received feedback on the success of their students and the placement of Croatia at international scales and started to discuss them. Within the PISA study, thousands of parents of sampled students received a personalized report on their child's competences in relation to the other 15-year-olds in the country, but also around the world, the description of levels of competences that could be compared to their school grades. This kind of feedback to schools and parents ensured not only a very high response rate of the participants for next PISA cycles but also increased the motivation for teachers to learn more about teaching methods in other countries in order to improve their teaching and assessment methods as well. The results of these surveys have deepened the interest of the society for quality education and faster changes in the system of compulsory and secondary education.

The Croatian Parliament adopted the *Strategy of Education, Science and Technology* in 2014, in which the focus of the planned changes was set on the basis of accurate external evaluation indicators, both nationally and internationally. Based on this strategy, preparations for a complete curricular reform have begun, and this education reform is undoubtedly one of the most demanding projects that Croatia faces at the beginning of the twenty-first century.

The current Croatian education system begins in preschool institutions, which cover children from the age of 6 months to their start of schooling. They can be run by local authorities or private nursery schools (legal persons, religious communities, and others). Elementary schools can also provide shorter preschool programs.

Elementary education, which lasts 8 years, is compulsory for children who are six and a half or over. There is an adult elementary education system for those who do not complete primary education by the age of 15. Secondary education is optional and is divided according to curricula into gymnasiums, vocational schools (technical, industrial, and craft based), or art schools (music, dance, art). Gymnasiums provide a comprehensive syllabus which lasts 4 years and includes a final examination, the state matura. Programs in vocational and art schools last from 1 to 5 years, and usually end with the production of a final assignment, but it is also possible to sit the state matura if pupils have completed 4 years of secondary education. Since 2010, state matura results have been the basis for entry to higher education institutions. Elementary and secondary education in state schools is free. Higher education institutions are divided into polytechnics, colleges of applied science, faculties, and art academies. All study programs were aligned by 2005 with the requirements of the Bologna Process as part of the creation of a European system of higher education.

International and National Assessments in Croatia Today

The system of external evaluation in education is one of the strategic objectives of Croatian education and is described in detail in the document "*Education Development Plan 2005–2010*" issued by the Ministry of Science, Education and Sports (2005). As a mechanism for the objective monitoring of the education system, it is one of the key factors which influences the improvement of the quality of the education system as a whole.

According to the education law, schools are required to participate in the external evaluation and use the results of the self-analysis and self-assessment as part of the external evaluation for the purpose of continuously improving the quality of education and their work.

External evaluation of education in Croatia is based on standardized examinations in major subjects such as mathematics and science conducted by the National Center for External Evaluation of Education (NCEEE) since 2006.

In cooperation with the Institute of Social Sciences Ivo Pilar during the school year 2006/2007, National Center for External Evaluation of Education organized and conducted the first experimental external evaluation of the educational achievements of elementary school students. The next school year an external evaluation of the educational achievements of all fourth and eighth grade students in elementary schools was carried out, where the entire population of 46,556 students was included. The elementary schools thus entered the system of external evaluation of the students' educational achievements. The basic objective of this project of external evaluation of the educational achievements of the fourth and eighth grades of elementary schools was to determine the level of acquired knowledge, skills, and abilities of students in particular subjects and curricula and to examine the pupil's abilities to interdisciplinary link contents from different subjects.

The National Center for External Evaluation of Education continued to develop a system for external evaluation of educational outcomes in primary schools and developed strategies, i.e., multiyear development projects such as Development and Strategy of National Examinations (2008–2009) and Development of final exams at the end of educational cycles (2011–2015). As a result of work on improvement of national exams, two more assessments were carried out in the following years: external evaluation of Biology in eighth grades (school year 2010/2011) and National Examinations in Mathematics in eighth grades (2011–2014).

Currently, Croatia is continuing to develop national exams which are standardized and designed to determine achievements regarding basic knowledge and skills of students in the most important subjects within key parts of educational cycles or/and at the end of compulsory education. National exams are based on the in-depth analysis of previously conducted tests, the psychometric characteristics of assessment tasks, and the obtained indicators. These examinations should provide a reliable insight into the functioning of the education system in order to determine the necessary measures of quality improvement of the system on the basis of these results.

Preparations for the introduction of graduation state exam as the final exam at the end of secondary education started with national secondary school examinations as well: national exams in first grade of gymnasium school programs in 2006, in second grades in 2007, in first grade of 4-year vocational programs in 2007, and in third grades of grammar school and 4-year vocational programs in 2008.

In 2008, the Croatian Parliament adopted the Law on Primary and Secondary Education which established the legal basis for the introduction of graduation state exams (matura) into the Croatian secondary school system. The Ministry of Science, Education and Sports prepared a rulebook on Graduation State Exams, which sets out the detailed rules for examining. After a comprehensive education campaign conducted in all 4-year secondary schools, the first graduation state exams were carried out in 2009/2010 school year.

All students, completing their education in gymnasiums, are obliged to take the graduating state exams to complete their secondary education. It is compulsory for students of 4-year vocational high schools, who successfully complete the fourth grade and want to continue their education at one of the universities in the Republic of Croatia as well.

By introducing graduation state exams, national standards for evaluating school achievements of students at the end of 4 years of secondary education were defined, and greater objectivity in evaluating students' achievements was ensured. The students' results at graduation state exams show objective student knowledge and achievements, and individual student exam results are also a form of evaluation for enrollment in higher education institutions. However, there is still a lot of issues regarding subjectively or qualitatively assessed competencies which need to be solved.

In 2017, the National Center for External Evaluation of Education began with the implementation of the project Development of the National Examination System, which is based on two major factors: the development of a national examination

system and the development of an item bank with metric and content characteristics of the items that will be available to teachers and students. Therefore, during 2018, in the pilot phase of this project, a software for building an item bank and test design, online test delivery, and marking was purchased. In April 2018, the first online assessment for primary school students in the field of Information Technology and Physics was successfully conducted. Most probably, this project will improve the teachers' role in the process of assessment in the near future since more and more teachers are participating in the development of the testing items, analyzing and interpreting of the results, and many of them are interested to attend seminars organized by the National Center for External Evaluation of Education. Croatia has continued with the implementation of international research and is currently participating in PISA, PIRLS, TIMSS, and ICCS.

Programme for International Student Assessment (PISA)

The PISA 2015 cycle is the sixth cycle of the Organization for Economic Cooperation and Development's survey and the fourth one in which the Republic of Croatia participated. It was the second time that science literacy was examined as the main domain, while reading literacy and mathematical literacy were examined as secondary domains. Additionally, it also examined the students' competencies in collaborative problem solving as an innovative domain.

Seventy-two countries participated in the study and a total of 540,000 students were tested, representing about 29 million 15-year-old students in participating countries. The Republic of Croatia was represented by 5809 15-year-old students from 158 secondary and 2 primary schools. Testing of students was performed for the first time exclusively on the laptops in all test domains. In addition to the cognitive test, students, their parents, and school principals filled out various questionnaires providing a large amount of background data linked to educational achievements.

Croatian Results

The average score of Croatian students in **science literacy** (Braš Roth et al. 2016) is 475 points, which is below the OECD average and is ranked 37th in the international rankings. By comparing Croatia's average results with the results of other countries, the achievements of Croatian students do not differ significantly from the achievements of students from neighboring Italy or Hungary, as well as Lithuania, Argentina, and Iceland. Compared with the results of PISA 2006 (Braš Roth et al. 2008), when science literacy was also the main test domain, there was a significant fall in the average achievement of Croatian students. On average, every 3 years, the achievements of Croatian students drop by about 5 points.

When it comes to knowledge and abilities on the scale of science literacy, almost a quarter (24.7%) of 15-year-old Croatian students did not reach proficiency Level 2, meaning they do not possess the basic science competencies necessary for everyday life. At the highest proficiency levels (levels 5 and 6), there were only 4% of Croatian students. When the distribution of Croatian students on a scale of science literacy in this cycle is compared with the previous three cycles, it can be noticed that second level in 2006 was not reached by 17% of students, 18.5% in 2009, 17.2% in 2012, and in this cycle by 19.2% of students. At the fifth and sixth levels in 2006, there were 5.1% students, 3.7% students in 2009, 4.6% students in 2012, and 4% of students in 2015. According to an analysis of the gender differences in Croatia, as well as in OECD countries, no statistically significant differences were found between girls and boys with respect to science literacy.

In **reading literacy** (Braš Roth et al. 2010) Croatian students achieved a below-average score of 487 points and were ranked 31st. By comparing the average results in reading literacy with the results in PISA 2009, Croatia has shown a trend of improving average results. In the 6-year period, Croatia has increased the average score by 11 points. Regarding the comparison of the distribution of Croatian students by the level of reading literacy in the 2015 cycle with the previous three cycles, it can be noticed that percentage of students below second level is slightly declining (21.5% in 2006, 22.4% in 2009, 18.6% in 2012, 19.9% in 2015) and increasing at the fifth and sixth levels (in 2006 there were 3.7% students, 3.2% students in 2009, 4.4% in 2012, and 5.9% in this cycle). When it comes to gender differences in the OECD countries, in this PISA cycle, girls have scored in average 27 points better than boys. In Croatia, this difference in favor of girls is 26 points and has been significantly decreasing compared to previous cycles: in PISA 2006, girls were better than boys by 50 points, in the PISA 2009 cycle by 51 points, and in the 2012 PISA cycle by 48 points. It is also important to notice the representation of boys and girls at the lowest and highest levels of reading literacy. In the group of students who did not reach Level 2, there are 25% boys and 15.1% girls, while at the highest levels of knowledge and skills, there are 4.7% boys and 7.0% girls.

Mathematical literacy (Braš Roth et al. 2013) was the weakest domain for Croatian students with an average score of 464 points which is below the OECD average. In this domain Croatia was ranked 41th. Compared to 2012, when mathematical literacy was the main test area, Croatian students achieved a weaker score by 7 points, but this difference is not statistically significant. Moreover, changes in the achievements of Croatian students in mathematical literacy since 2006 did not prove to be significant. However, it is important to notice that almost one third of the Croatian students could not reach the second level in mathematical literacy, which is the basic level of mathematical competencies. It can be noticed that second level in 2006 was not reached by 28.6% of Croatian students, 33.2% in 2009, 29.9% in 2012 and 29.9% in 2015. At the fifth and sixth levels in 2006 there were 4.8% of students, 4.9% of students in 2009, 7.0% of students in 2012, and 5.6% of students in the 2015 cycle. As far as gender is concerned in OECD countries, boys are on average more successful in math than girls by 8 points. In Croatia, boys also have significantly better results in math than girls, and this difference is 13 points. If this

difference is compared to the previous PISA cycles, the difference in boys' benefit has not changed significantly (in 2006 it was 13 points, in 2009 it was 11 points and 12 points in 2012). Given the presence of boys and girls at the lowest and highest level of mathematical literacy, it is noted that the group of students who did not reach Level 2 comprised 30% boys and 33.9% girls, while at the highest level of knowledge and abilities 7.1% were boys and 4.1% were girls.

In the PISA 2015 cycle, an innovative domain was developed to measure students' competences in **collaborative problem solving** (Braš Roth et al. 2014b). Evaluation of the ability to collaborate to solve the problem was carried out in 52 participating countries. In the overall ranking of 52 countries that assess the competencies in collaborative problem solving, Croatia is ranked 32nd. The average Croatian student score was 473, which put Croatia in a group of countries with a statistically lower score than the OECD average. The comparison between countries has shown that the results of Croatian students are not statistically significant compared to the results of Italy, Russia, Hungary, Israel, and Lithuania.

In order to better interpret students' achievements in evaluating collaborative problem solving, the overall scale is divided into five levels of knowledge and achievement. Below the first level, there are 6.6% of Croatian students, while more than a quarter of Croatian students (28.7%) are at Level 1 and only have basic skills for collaborative problem solving. The highest percentage of students (41.8%) met Level 2, which means they were able to contribute to a collaborative problem solving and to negotiate with other members of the team on procedures how to solve the problem. At the third level there were 20%, while at the highest level there only 2.4% of Croatian students, which was ten times less than in first ranked Singapore. In the PISA 2012 cycle, which focused on mathematical literacy as the main test domain, financial literacy was tested for the first time as a secondary domain of assessment.

Financial literacy (Braš Roth et al. 2014a) was tested in 18 of the 65 participating countries, including the Republic of Croatia. On the overall scale of financial literacy, Croatia was ranked 14th. The average Croatian score was 480 points, which placed Croatia in a group of countries with a significantly below the OECD average. Cross-country comparison showed that the score of Croatian students did not differ statistically from the results of the United States, the Russian Federation, France, Slovenia, Spain, Israel, and Slovakia. Students' achievements are presented on the overall financial literacy scale, which includes five levels of knowledge and abilities. On this scale, 15.5% of Croatian students did not reach Level 2 or have basic skills in financial literacy. On the other hand, slightly more than 10% of Croatian students achieved the highest level of excellence level (fifth level) in this area.

By comparing results by gender, in almost all countries, including Croatia, there was no difference between boys and girls. Correlations with achievement in reading literacy and mathematical literacy on the one hand and with achievement in financial literacy on the other hand are extremely high and positive. In other words, students that achieve better results in mathematical and reading literacy also achieve better results in financial literacy. Greater correlation was found with mathematical literacy than reading literacy.

How to Go Further?

To continuously improve and enhance the quality of the education system, it is extremely important to develop a model which uses the results of periodic external examinations to monitor the achievement of educational outcomes at the national level, as well as the model for the use of indicators gained under international educational studies. The educational authorities in the Republic of Croatia devoted a lot of attention to the continuous upgrading of quality and excellence in education. This is determined by many factors, including digitization of elementary and secondary education, raising teachers' level of expertise, self-evaluation of schools, and national examinations as an external evaluation. Much has been done especially in the field of external evaluation of education and self-evaluation of schools in the last decade. Unfortunately, comparative results and other indicators gained in international research have not been used enough to plan or improve educational work so far. Perhaps the best indicator of the inadequate use of the obtained results is precisely the fact that, for example, the PISA results in all three test domains have hardly changed in three consecutive PISA cycles. Croatia is not the only country where there is no significant change in the average results of any test domain since the country started participation in the survey. The average results in the test domain have almost remained the same for 10 years.

The reason for this can be found in the fact that no significant changes in educational background occurred during that period, which could lead to substantial changes in educational outcomes. It is also possible to look for the reason in the fact that education policy did not sufficiently clarify goals in relation to indicators of international research. Although teachers and educational professionals are well informed about the relatively low average score of Croatian students, there is a lack of a defined action plan to improve such results in the following cycles of various international studies in which Croatia participates in order to monitor the quality of the education system. However, as in other education systems, there is certainly a certain percentage of teachers in Croatia who are continually trying to improve their work and student achievements, regardless of politically defined educational decisions and drafted reforms. They are well informed about contemporary educational practices and ways of monitoring achievements, many of them with the mentor or counselor status actively cooperate with the Teacher Training Agency and the National Center for External Evaluation of Education and through seminars and different working groups also contribute to the professional development of their colleagues.

In addition, insufficient attention has been given to secondary analysis and linkage with national, as well as other international research. For example, it is interesting to note that Croatian students at the age of 10 as participants in the PIRLS 2011 study achieved above-average scores on the international scale, but at the age of 15 in the PISA survey, they turn out to be below average three times in a row. Croatian educational experts have not yet given an answer to the question of what may have happened during the last 4-year period of the compulsory education

where students' competence in reading literacy and reading engagement suddenly falls and what reactions or curricular changes are needed to improve the results.

National exams are more oriented in measuring educational outcomes according to the national curriculum, but the main science or mathematical competencies that are assessed in international research such as PISA and TIMSS should be very similar to most prescribed educational content in different countries, only the questions are placed in the actual life context with the aim of assessing students' ability to apply this knowledge in everyday life situations. It is therefore important that the development of national exams methodologically approaches this international criteria, especially in the development of test instruments.

Learning for a test or preparing students for key national tests poses a risk of over-memorizing facts instead of adopting basic concepts and developing skills in applying the acquired knowledge in everyday life situations. PISA is a kind of assessment where the competences that are measured by the framework and the exam questions themselves are clearly defined and the level of knowledge and skills that a learner needs to possess at a certain level as well. According to that, teachers' better knowledge of the PISA concept could also serve for planning adequate teaching methods due to efficient development of the determined competencies. In that case, the process of monitoring of the students' progress is used directly and efficiently for constant modification of teaching methods and metacognitive data for advancing the learning process itself.

Worldwide, recent lists of twenty-first-century skills are extended to more and more soft skills, behavioral skills, contextual learning skills, creative and critical thinking, self-management, cultural and health awareness, civic and entrepreneurial literacy, etc. The demand for developing these skills comes from the global labor market and requires changes parallel to changes in the global economy and from conditions in modern, multicultural societies. Educational systems should respond as quickly and efficiently to such requirements. That is why changes in national curricula occur more and more often, and these changes should be based on precisely measured and analyzed data. Therefore, evidence-based policy expects increasingly more from the monitoring of student achievement, so even this process of evaluation is rapidly and ever changing.

Croatian Strategy of Education, Science and Technology defined also the development and establishment of an ICT system for digital learning outcomes as one of the measures for educational system improvement. Computer-based assessment was already successfully used in ICILS and PISA survey a few years ago. Use of technology in monitoring of students achievement is not only to measure ICT literacy skills, but should also be extended to national exams and everyday use in the learning process. This type of assessment opens the possibility for students' knowledge and skills to be tested through interactive tasks, using simulations and other innovative item types or using different sources of information during the test session. Collaborative problem solving as a competence was already tested in the PISA 2015 cycle; critical thinking and creativity are just some of the competencies that are already developing for the next cycles.

Computer-adaptive testing allows the teacher and the student to monitor their level of performance and thus obtains faster and better feedback about the parts of the lesson to be repeated.

Web-based testing is also one of the solutions for very convenient test management, and Croatia has already started to pilot that option of monitoring achievement. However, there will always be competencies and skills that only teachers with their professional knowledge can and must evaluate.

References

Braš Roth, M., Gregurović, M., Markočić Dekanić, A., & Markuš, M. (2008). *PISA 2006 – Science competencies for life*. Zagreb: Nacionalni centar za vanjsko vrednovanje obrazovanja – PISA centar. https://mk0pisancvvooeeubi4r.kinstacdn.com/wp-content/uploads/2018/09/IZVJESTAJ-CJELOVITI_PISA2006.pdf.

Braš Roth, M., Markočić Dekanić, A., Markuš, M. i., & Gregurović, M. (2010). *PISA 2009. Reading competencies for life*. Zagreb: Nacionalni centar za vanjsko vrednovanje obrazovanja. https://mk0pisancvvooeeubi4r.kinstacdn.com/wp-content/uploads/2018/05/IZVJESTAJ_PISA2009_press.pdf.

Braš Roth, M., Markočić Dekanić, A., Markuš Sandrić, M. i., & Gregurović, M. (2013). *PISA 2012: Mathematical competencies for life*. Zagreb: Nacionalni centar za vanjsko vrednovanje obrazovanja. https://mk0pisancvvooeeubi4r.kinstacdn.com/wp-content/uploads/2018/05/IZVJESTAJ_PISA2012_matematicke_46_finn.pdf.

Braš Roth, M., Markočić Dekanić, A., Gregurović, M., & Ružić, D. (2014a). *PISA 2012: Financial literacy*. Zagreb: Nacionalni centar za vanjsko vrednovanje obrazovanja. https://pisa.ncvvo.hr/wp-content/uploads/2018/05/IZVJESTAJ_PISA2012_Financijska_26_finn_2.pdf.

Braš Roth, M., Markočić Dekanić, A., & i Gregurović, M. (2014b). *PISA 2012: Problem solving competencies*. Zagreb: Nacionalni centar za vanjsko vrednovanje obrazovanja. https://mk0pisancvvooeeubi4r.kinstacdn.com/wp-content/uploads/2018/05/IZVJESTAJ_PISA2012_problem-solving_15_zaTisak.pdf.

Braš Roth, M., Markočić Dekanić, A., & Markuš, M. (2016). *PISA 2015 – Science competencies for life*. Zagreb: Nacionalni centar za vanjsko vrednovanje obrazovanja. https://pisa.ncvvo.hr/wp-content/uploads/2018/05/PISA-2015-kb.pdf.

Law on Primary Education. Official Gazette No. 59/90, 26/93, 27/93 and 7/96. Zagreb: Narodne novine.

Law on Secondary Education. Official Gazette No. 19/92, 27/93 and 7/96. Zagreb: Narodne novine.

Nacionalni okvirni kurikulum za predškolski odgoj i obrazovanje te opće obvezno i srednjoškolsko obrazovanje. (2010). Zagreb: Ministry of Science, Education and Sports.

Report on external evaluation in elementary schools. (2009). Zagreb: Nacionalni centar za vanjsko vrednovanje obrazovanja.

Strategy on Science, Education and Technology. Official Gazette No. 124/2014. Zagreb: Narodne novine.