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Comparing Elephants and Bananas in Educational Achievements: What Do Data Reveal?

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Abstract

The problem of functional illiteracy emerged in the Bulgarian society when the results of the OECD's Programme for International Student Assessment (PISA test) were announced. Until then it was not aware of such a deficit. The national external assessment of students' educational achievements did not give any signs of a pervasive systemic deficit in the Bulgarian education. A comparison of the two tests' scores however reveals a considerable discrepancy. Looking at the tests' metadata, it becomes obvious the comparison is between elephants and bananas and that explains the inconsistency.

The PISA test is an OECD instrument to put the journey to a learning society on track. It is future-oriented and reflects the changing needs of economic and productive life. PISA measures achievements through the learning society principles that include instrumentalism and pragmatism, therefore focusing on skills and competences. It discerns the types of knowledge needed by the future "knowledge workers" that need to be adaptable, which all industries will be increasingly dependent upon.

This paper compares the two datasets of students' scores and the tests' measuring methodologies. It concludes that the national education system has a conceptual basis and measurement tools that are different from OECD's. It further concludes that the national system fails to adapt to the needs of a changing society. However, it has an important ally in the face of the civil society, which provides its own resources to satisfy learning needs.

Keywords: Learning society, functional illiteracy, educational achievements, knowledge worker

INTRODUCTION

Frameworks that conceptualize quality of education are necessarily value-based. Looking at the most dominant among them, we can differentiate between the humanist/progressive approach, typical with its focus on the development of the individual and on collective human development for social change,

and the economist approach, focused on efficiency and effectiveness and the achievements of learning outcomes at reasonable cost. In 2005 the United Nations drew attention to the importance of quality in education, issuing its Global Monitoring Report: the Quality Imperative, which reviews research evidence on the multiple factors determining quality and maps out key policies for improving the teaching and learning process, especially in low-income countries.

Comparative educational scholars emphasize the importance of asking critical questions about quality education: how to access it and for what purposes; what contextual and cultural factors are important; what implementation issues and local-level realities must be considered for true understanding of standardized assessment results; what content, skills and values are necessary and desirable ingredients; what roles teachers and administrators play; and what benefits accrue in terms of outcomes for employment and labour market needs (Bray, Adamson and Mason 2014). Critiques of narrow interpretations of standardised assessment data contrast with research-based evidence that participation in large scale assessments such as PISA, TIMSS and PIRLS can indeed be beneficial to identify needed reform refinements and implementation shortcomings (Popham 2000).

However, despite setting goals of quality education in terms that embrace a broad range of personal and social learning outcomes, the literature shows that assessment of progress in achieving quality is mainly restricted to those cognitive learning outcomes that are easy to measure using pen and paper tests.

Education is universally essential for the economic, social, and human development. It is subjected to the results of progress that it has engendered itself, both with regard to content as well as methods and established aims. In order to integrate into the world economic and social life, people must not only acquire the tools of traditional knowledge but must also be capable of acquiring new skills demanded by a knowledge society. The rapid changes in technological and scientific knowledge make learning an on-going process. Education-wise, the advantages of globalization may include numerous benefits, such as global sharing of knowledge, skills, and intellectual assets; promoting international understanding, collaboration, and acceptance of cultural diversity across countries; facilitating communications, interactions, and encouraging multi-cultural contributions among countries.

With the aim of contributing to the debate, this paper explores two assessments – one national and one international – of educational achievements in reading/literature at the same level of education in an attempt to analytically compare them. The results of international and national assessments in education are expected to be comparable and completing, since international assessments are meant to assist reforms in education. In this national case they appear not to be, and the achievements deviate very significantly both in terms of substantive results and as trends.

The functional illiteracy problem

Low literacy has many consequences: it affects people in their daily lives negatively, it can jeopardize their future and it has a significant effect on society, both socially and economically. On individual level low literacy means, perhaps not exhaustively, limited ability to obtain and understand information; much higher probability for unemployment; absence of advanced opportunities and lower income; low-quality jobs and little access to professional development; precarious financial situation; low self-esteem, often accompanied by isolation; and it also has an impact on health. On societal level it means overall less competitive economy and increased unemployment and welfare payments, slower

GDP growth rate, workforce less competitive in the global knowledge economy and weak community involvement and civic participation.

The ability to function effectively in one's community is referred to by UNESCO, the international agency that researches education, science and communication, as functional literacy. According to the definition[1], it involves the skills needed to cope with the circumstances of life. Functional literacy goes beyond the mere capacity to read and write, since a person may be able to read the words in a text and not grasp its content. By analogy, students may be able to write sentences, but nor express complete, cogent thoughts. Functional literacy is the basis for a functional society. Reversely, widespread functional illiteracy will mean living in a dysfunctional society.

To be able to establish whether or not literacy is truly functional, it has to be measured at different levels of proficiency. The UNESCO, the OECD and the IEA[2] measure literacy and other key knowledge skills of children, young adults, and adults through large-scale, international assessments of strengths and weaknesses in different countries. Research such as the IALS and the ALL[3] build on each other (Thorn, 2009). These international test types generally measure literacy and numeracy skills in a variety of ways, including mapping the whole literacy spectrum and grouping the performance and the abilities into discrete levels.

What and how is PISA testing? What do the results mean?

It is the baseline logic in PISA[4] that the rapid digitalisation of communication is having a profound impact on the kind of information literacy that young adults will need to demonstrate in their future jobs and in their wider social interactions. Evolving technologies have, for example, changed the ways people read and exchange information, whether at home, at school or in the workplace. Therefore, a greater emphasis is placed on multiple-source texts, i.e. texts composed of several textual units, created separately by different authors (Rouet, Britt and Potocki, 2019).

The reading literacy framework includes multiple-source units. In 2018, these included: searching for information across multiple documents, integrating across texts to generate inferences, assessing the quality and credibility of sources, and handling conflicts across sources (List and Alexander, 2018; Barzilai, Zohar and Mor-Hagani, 2018; Stadtler and Bromme, 2014; Magliano et al., 2017). Furthermore, it includes the explicit assessment of reading fluency, defined as the ease and efficiency with which students can read texts.

PISA conceives of reading literacy as a broader set of competencies that allows readers to engage with written information, presented in one or more texts, for a specific purpose (RAND Reading Study Group and Snow, 2002; Perfetti, Landi and Oakhill, 2005). To engage with what they read, readers must understand the text and integrate it with their pre-existing knowledge. They must examine the author's point of view and decide whether the text is reliable and truthful, and whether it is relevant to their goals or purpose (Bråten, Strømsø and Britt, 2009).

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[1] Retrieved from http://uis.unesco.org/node/334638
[2] International Association for the Evaluation of Educational Achievement
[3] Adult Literacy and Life Skills Survey
[4] Programme for International Student Assessment

Evident from the methodological description is that a very important characteristic of the test is its future orientation. PISA recognises that reading is a daily activity for most people, and that education systems need to prepare students to be able to adapt to various scenarios in which they will need to read as adults. It is not enough to be a proficient reader; students should also be motivated to read and be able to read for a variety of purposes (Britt, Rouet and Durik, 2017; van den Broek et al., 2011). All of these considerations are reflected in the PISA 2018 definition of reading literacy: *Reading literacy is understanding, using, evaluating, reflecting on and engaging with texts in order to achieve one's goals, develop one's knowledge and potential, and participate in society*. The assessment covers a range of difficulty levels. It also requires students to use diverse processes, or different ways in which they cognitively interact with the text.

The PISA 2018 reading literacy framework identifies two specific cognitive processes involved in understanding, distinguished by the length of the text to be understood. Constructing an integrated text representation is associated with tasks such as identifying the main idea of a piece of text or a set of texts, summarising a long passage or giving a title to a piece of text or set of texts. Inter-textual inferences tend to require a high level of proficiency, perhaps because they involve distinct and demanding cognitive processes (Barzilai, Zohar and Mor-Hagani, 2018).

  – The highest-level process identified by the PISA 2018 reading literacy framework is "evaluating and reflecting". Here, readers must go beyond understanding the literal or inferred meaning of a piece of text or a set of texts to assess the quality and validity of its content and form. Three specific cognitive processes are classified under evaluating and reflecting:

  – Assessing quality and credibility, which requires the reader to combine the content of what is said in the text with peripheral cues, such as who wrote it, when, for what purpose and judge whether the content is valid, accurate and/or unbiased. This may also involve identifying the source of the information and thereby identifying the author's intentions and judging whether the author is competent and well-informed.

  – Reflecting on content and form, where readers evaluate the quality and the style of the text. They need to assess whether the content and form adequately express the author's purpose and point of view. In order to do so, they may need to draw from their real-world knowledge and experience to be able to compare different perspectives.

  – Corroborating and handling conflict, where readers need to compare information across texts, recognise contradictions between pieces of text and then decide how best to manage such contradictions. They can do so by evaluating the credibility of the sources, and the logic and soundness of their claims (Stadtler and Bromme, 2014). This cognitive process is commonly used when examining multiple-source texts.

As described, reading literacy includes the main operations related to learning through reading. Comprehension is the core of the process since it involves processing operations like combining information and making sense of the text through construction of mental patterns, showing how the text relates to reality. It requires the reader to make links between the content and her/his perceptions and experience and new, external information. Comprehension is checked in the use, which requires direct implementation of the information and ideas contained in the text in the performance of a specific task and the achievement of a specific goal. Assessment is a new component, which adds the

idea of reading as a targeted activity where the reader should make a series of judgments, described above. This skill is traditionally related with critical thinking and is particularly salient nowadays.

The texts also involve various forms of visualization such as diagrams, images, maps, tables, graphs etc. They contain the entire information necessary to perform the task. Thus, the student should discover and rationalize specific information or elements thereof to be able to answer the question. The tasks follow a set scenario, which is a combination of several thematically linked texts, accompanied by questions of various format and level of difficulty.

To sum up, PISA assesses reading literacy based on three elements: (i) text – the diversity of the reading materials; (ii) cognitive processes – the cognitive approach that shows how the reader interacts with the text. (iii) reading scripts – the diversity of reading situations or purposes. These three components have a direct impact on the structure and content of the tasks in the test.

The meaning of scores

As described in its methodology, PISA reports both the difficulty of questions and the proficiency of test-takers on a single continuous scale, based on item-response theory models. The scale shows difficulty of each question and makes it possible to locate the level of proficiency in the subject that the question demands. Since the proficiency of students appears on the same scale, one's skill or literacy level can be assessed by the type of correctly performed tasks. Estimates of student proficiency are based on the kinds of tasks students are expected to perform successfully.

A distinctive feature of PISA scores is that they do not have a substantive meaning. Instead, they are set in relation to the variation in results observed across all the participants in the test. Theoretically, there is no minimum or maximum score in PISA. The results are scaled to approximately fit normal distributions, with means around 500 score points and standard deviations around 100 score points. In statistical terms, a one-point difference on the PISA scale therefore corresponds to an effect size (Cohen's d) of 0.01; and a 10-point difference to an effect size of 0.10.

As pointed out earlier, PISA scales are divided into proficiency levels. This assists their interpretation in substantive terms. Thus, for PISA 2018 the range of difficulty of reading tasks is arranged in eight levels of reading literacy: the simplest tasks in the assessment are at Level 1c and they proceed to Level 6 in ascending order. For each proficiency level the kinds of knowledge and skills needed to complete the respective tasks successfully are defined. Each proficiency level corresponds to a range of about 80 score points. Hence, score-point differences of 80 points can be interpreted as the difference between successive proficiency levels.

For the first time in 2018, the reading test was computer-based. The transition from printed to digital text reflects the changed attitude to reading, as well as the time dedicated to it. The underlying concept is that digital reading has significantly modified the reader's role and necessitates different knowledge and skills, along with different reading strategies, and is therefore changing the reader behaviour. The framework and concept put an accent on the students' ability to find, compare and combine information from several sources, sometimes in different formats. The tasks reproduce real reading situations and formats in an electronic environment, such as online forum, blog, internet site, excerpts from electronic newspaper or academic journal articles etc.

The first indicator in the PISA test is the average score, calculated on the basis of the individual results of all the students from the nation. The average country score is analysed versus the average OECD countries' score, which in 2018 was 487 points.

PISA results in reading of the Bulgarian students

The average score of the Bulgarian students in 2018 was 420 points versus the average OECD countries' score of 487 points. This result places Bulgaria last among the EU and EEA member states.

The graph below, published in the OECD report, shows the average scores of the Bulgarian students in the waves held between the years 2000 and 2018. Evidently, after the year 2012 the average scores of the Bulgarian students are steadily deteriorating.

Graph 1

Source: OECD/PISA

As described in the previous section, to interpret the substantive meaning of these results we should use the average country score indicator. When compared, the 2015 proportion of 432/493 is very similar to the 2018 420/487, so we can assume negligible difference in the performance. Thus, score itself is not the most disturbing fact. Traditionally, level 2 of the 6-level descriptive scale is defined in PISA as a critical threshold in the students' learning achievements, meaning that students whose results are below level 2 have significant omissions in their learning, qualified as functional illiteracy.

The next graph shows that the proportion of Bulgarian students below the critical level 2 threshold is quite large in all stages of the test. The students in the OECD countries with scores below level 2 for instance form just 22.7% versus 47.1% for the Bulgarian group in the latest assessment. At the same time, the proportion of students whose results are at the highest levels 5 and 6 is small and steadily going down after 2012.

Graph 2

Proportion of Bulgarian students with results below level 2 and at levels 5 and 6 in reading, PISA 2000, 2006, 2009, 2012, 2015 and 2018
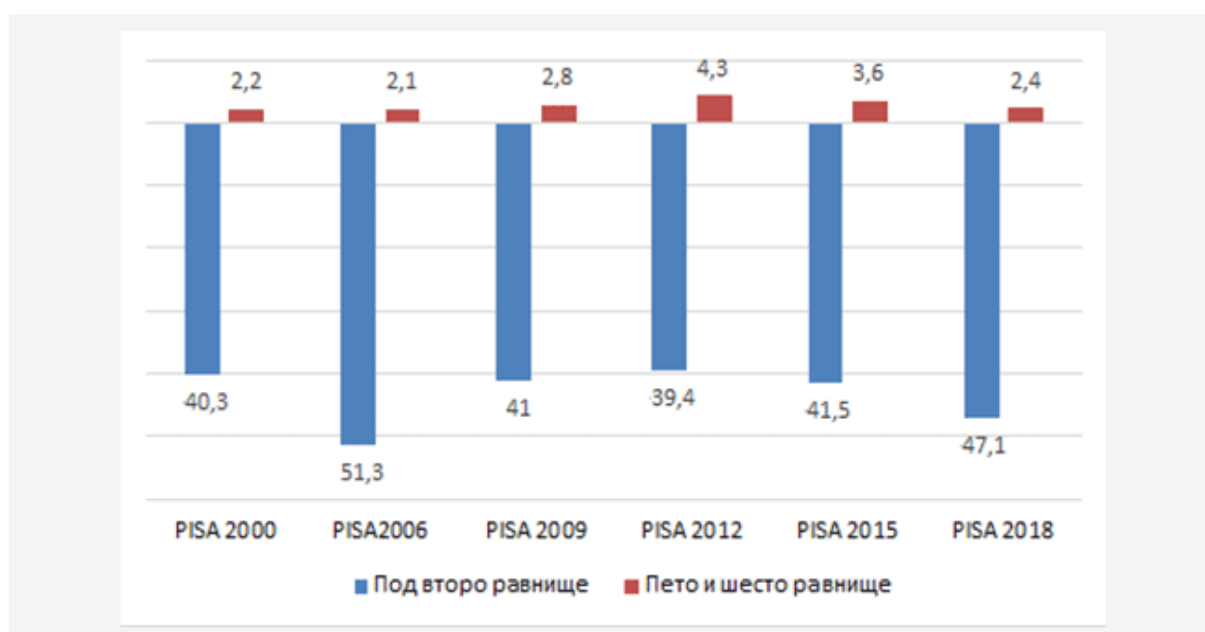
Source: OECD/PISA

The conclusion is a steadily high proportion (close to 50%) of functionally illiterate students and an insignificant proportion of students with maximum achievements (less than 5%). The 2018 scores are similar to the 2009 scores, which tells us that no meaningful change has occurred in that period.

It further causes anxiety that Bulgaria is the only country where the difference in the learning results of the students in the highest and lowest quartile of the economic, social and cultural status is shrinking as a result of deteriorated scores of the students with the high socio-economic status. At the same time in Bulgaria the share of students with less favourable socio-economic status who achieve high results in reading (levels 5-6) is among the lowest of all the countries included in the 2018 test wave – 6% versus an OECD average of 11%. Also, the results show great heterogeneity in the quality of the education offered by the different schools. Bulgaria is one of the countries with the greatest variation in the "reading" results among the schools – 54.7%. Particularly worrying is also the academic segregation: the concentration of low achievers in certain schools and of high achievers in other schools is especially high (in fact among the highest).

All PISA waves so far demonstrate that girls consistently have higher scores than boys, and here Bulgaria is not an exception (30 points difference in the OECD countries, 40 points in Bulgaria).

National external assessment at grade 7 and meaning of the results

The national external assessment at grade 7 in Bulgarian language and literature (corresponding to reading comprehension) is a form of test to evaluate educational results, which are then used by the secondary level schools as an entry score. The objectives of this test, as formulated by the Ministry of Education and Science, are to *diagnose the individual progress and the educational needs of the students; monitor the educational process for the purposes of quality improving policies and*

measures; establishing the level of achievement of the expected results as set out in the training curriculum and in the state educational standard of comprehensive education. The tasks in the test are based on the mandatory learning content.

The maximum result is 100 points. The assessment follows standardized criteria and every task can generate a set number of points, corresponding to its specifics, level of difficulty and the solution logic. The result is expressed in total number of points.

As stated in the objectives, the national external assessment data are meant to be used at system and school level to reform the school curricula, plans and content, and for readjusting teaching methods with the aim of increasing the quality of education. In reality however, firstly the published data on the results of the national external assessment in Bulgaria are a real challenge to use. They are of low quality and not fit for processing due to numerous omissions and inconsistencies. The absence of codes attributed to the schools until 2017 requires a disproportionate effort to make them usable and even after that moment they are very unreliable because the names of many schools change and are either not written correctly, or on occasions not at all. The graphs included here are derived from data subject to considerable cleaning and processing and exclusion of all entries (schools) that cannot be identified. Secondly, the educational administration is not interpreting and analysing the results. This is partly done by the Institute for Research in Education, an independent analytical centre working to help overcome the deficits. The Institute's mission states that governance in education needs creation and intensive exchange of knowledge.

Many analysts on the education field define the Bulgarian learning paradigm as still focused on an educational model that is typical of the beginning of last century, which features a high level of standardization, formalism, unification and accuracy, teaching factual academic knowledge and formation of a narrow set of very specific skills. The described model is fit for a static system where the knowledge is fixed and once for a lifetime. In clear contradiction to it, there is a nearly universal consensus that in today's dynamic reality educational institutions should create skills for continuous learning.

Economists of the Bulgarian Academy of Sciences point out that the economy of Bulgaria in 2020 differs dramatically from that in 1990. The proportion of low-tech production in the structure of the industry is diminishing at the expense of increasing medium- and high-tech intensity. The ICT and outsourcing sectors are developing fast, export-oriented productions that are part of the global "value chain" are enlarging. All that shows how the set of skills necessary to practice a profession are changing at an accelerating step.

Those observations in the literature give us grounds to assume that the national system of education is lagging behind the societal development (confirmed by a series of national and international reports) and fails to adapt to the demands of the modern society. Part of the public debate on the topic is focused on whether the system should provide knowledge or skills acquisition. Worldwide although qualifications and professions are still preserving their significance, many educational systems are refocusing their attention to skills as smaller and more flexible units, and create conditions to form them fast, upgrade them and transfer them from one profession to another and between sectors. In the national content it appears there is essential lack of understanding that in order to lead to knowledge, learning needs to build the basic skills of retrieving, processing and analysing information through a critical thinking process.

In this analysis we look at two datasets – national and international - containing the results of educational achievements' assessment in reading/language and literature. They are for the years 2015 and 2018, the last two PISA waves, since those are the only publicly available national PISA test results to compare with the results of the national external assessment after grade 7, i.e. at the same level of schooling.

The Bulgarian grading system uses the following scale: up to 17.5 points means a poor score; 18–31,5 points means a pass; 32–58,5 points are classified as a good score; 59–86 points mean a very good score and 86,5–100 points are the excellent score. In other words, looking at the year 2018 an average score of 51.98 points will be a good result in the Bulgarian interpretation, while the 420-average score in PISA suggest functional illiteracy.

The announced[5] average score in BLL (Bulgarian language and literature, corresponding to the reading ability in PISA) for the year 2015 was 58.68 (out of 100), which in the Bulgarian grading system is equal to a good-very good score. Our data map shows a different picture - in 2015 the average score in NEA/BLL in the vast majority of the 265 municipalities was below 50 points, with roughly 2% of them having scores around the 50%. In 2018 again the average score is predominantly below 50 points with only one municipality as an exception.
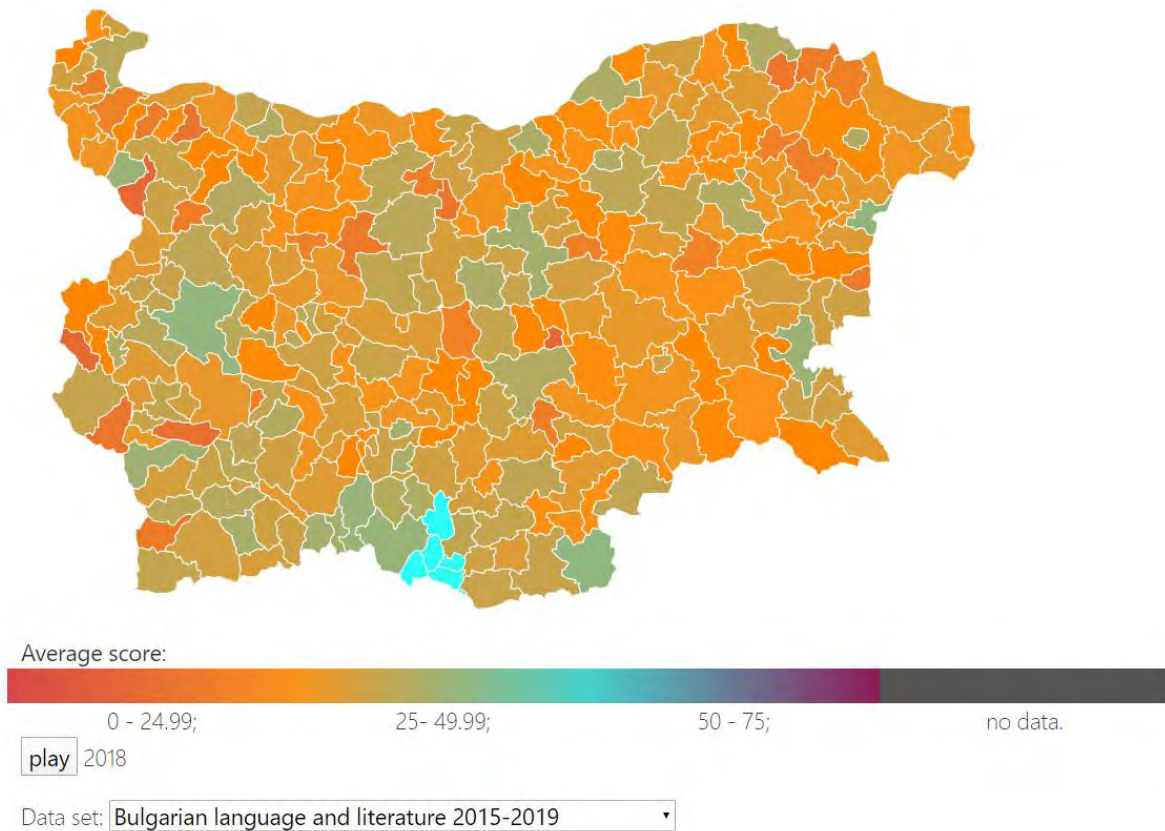
Figures 1 and 2

Average National External Evaluation scores by municipality - 7-th grade: 2015
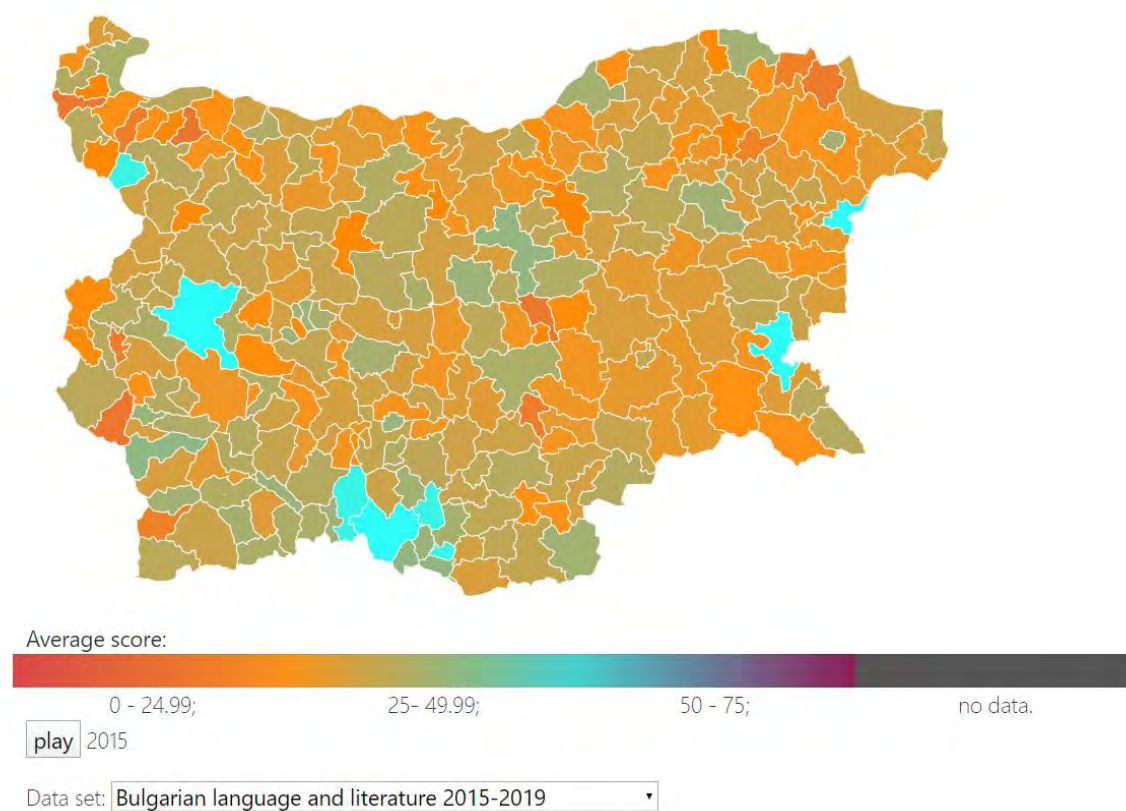
Average National External Evaluation scores by municipality - 7-th grade: 2018

Table

Year	PISA	NEA
2018	420/487	51.98/100
2015	432/493	34.10/100

It is important to point out that in most grading systems worldwide a score of 50 and below is generally considered a failure, that is, below acceptance standards. There are few exceptions (Ireland, Latvia, Lithuania in the EU, certain countries in Africa and Asia) of grading systems where scores between 40 and 50 points are considered a pass, defined as "minimally accepted"[6].

Compared to previous years, the 2015 results of the national external assessment (NEA) demonstrate a downward trend. Achievements of the students of the cohort in this year were worse compared to their NEA results after grade 4.

So how do the two sets of results compare and what do we learn from them? Firstly, the two sets of scores are incomparable due to the large discrepancy in the testing method and content of the learning achievements. The international test is visionary: it tells us where the country stands globally in terms
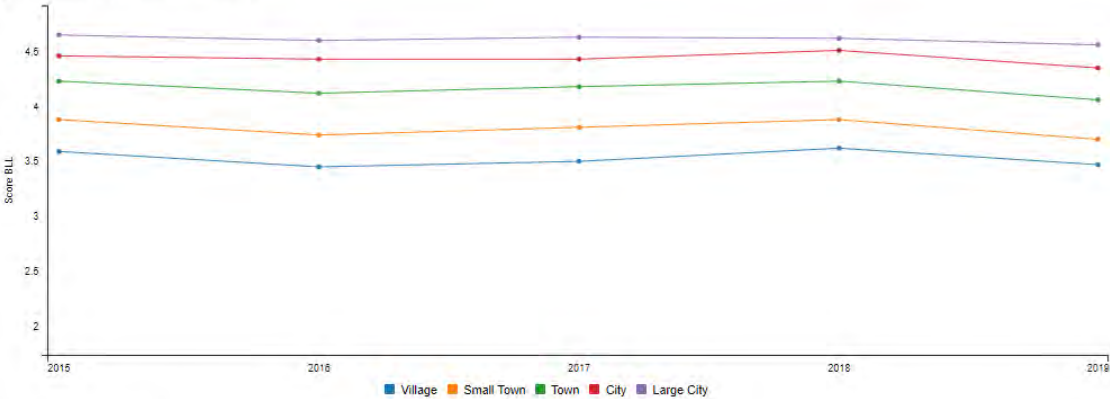
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[6] Grading systems by country

of adaptability of a projected future society to the development dynamics based on degrees of proficiency and skills acquisition. The national assessment is myopic: it tells us what the students have learnt or not of the standard educational content. Secondly, the national results grading system does not correspond to the prevailing standards internationally and cannot provide a reasonable level of assurance that the measurement is adequate. Although they are basically testing one and the same thing – literacy and reading ability – these scores are in no way comparable.

Overall, the comparison discloses that the educational system fails to perform. It produces certain outstanding results on individual level, evidence of which is the continuous success of Bulgarian students at international Olympiads and the very good representation of Bulgarian students in prestigious universities. But clearly it does not perform enough to reproduce a well-functioning society. Indeed, this analysis is only based on a single competence, that of reading comprehension, and is thus limited. Therefore, it is important to point out here that those are actually the highest achievements of the Bulgarian students. The results in math and science are even worse.
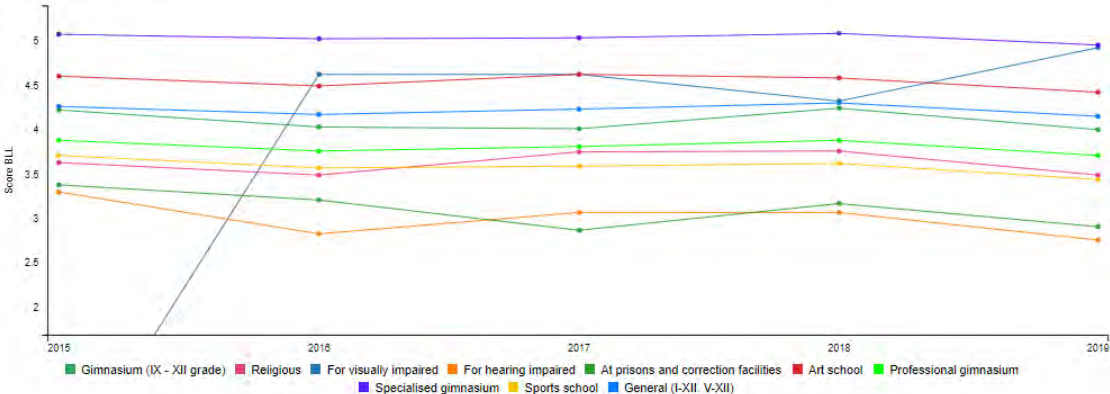
The data, national and international, are consistent in one indicator – both show that the size of the place of living is a factor of quality of education and academic success. We see the highest scores in the largest settlements (cities with over 1 million and between 100 thousand and 1 million residents) and significantly lower in the smaller ones, descending along with the size of the settlement. The PISA test shows the same distribution of the results across the places of residence of different size.

Graphs 3 and 4

By location size (PISA)

Village ■ Small Town ■ Town ■ City ■ Large City

By School type

■ Gimnasium (IX - XII grade) ■ Religious ■ For visually impaired ■ For hearing impaired ■ At prisons and correction facilities ■ Art school ■ Professional gimnasium
■ Specialised gimnasium ■ Sports school ■ General (I-XII, V-XII)

As seen on the above graph, the type of school also matters and here the data reflect the general trend of specialised (in math, science or various languages) comprehensive secondary schools demonstrating the best performance. An interesting fact worth researching is the exceptional performance of schools for visually impaired students.

It is largely believed that innovation has a role to play in providing good quality education and creating opportunities to develop a favourable learning environment and flexible approaches to teaching. This is also suggested by the European Commission[7] and OECD, which states that "*In addition to quality learning, contemporary education needs to equip learners with transversal skills such as creativity, critical thinking and problem solving, as well as resilience and the ability to adapt to change*"[8]. This assertion is checked here through comparison of the results of the so-called innovative schools with those of the traditional ones.

In the words of the Ministry of Education, innovative schools are a model of building the new educational paradigm for improving academic results and boosting critical thinking and creativity through innovative educational processes, teaching methods, school leadership and educational strategies. It is a bottom-up initiative where schools develop the innovative methods and are expected to disseminate and make them available to other schools. To qualify as innovative, a school should have the following characteristics:

- Innovative learning content, curricula, and training plans. New learning standards are introduced, and students are trained to develop critical thinking. The aim of the innovation should be increased quality of the education.
- Innovative teaching methods and supportive learning environment.
- Innovative management and academic process organization. Directors are expected to provide for professional development of their teachers and pedagogical staff and encourage student development.
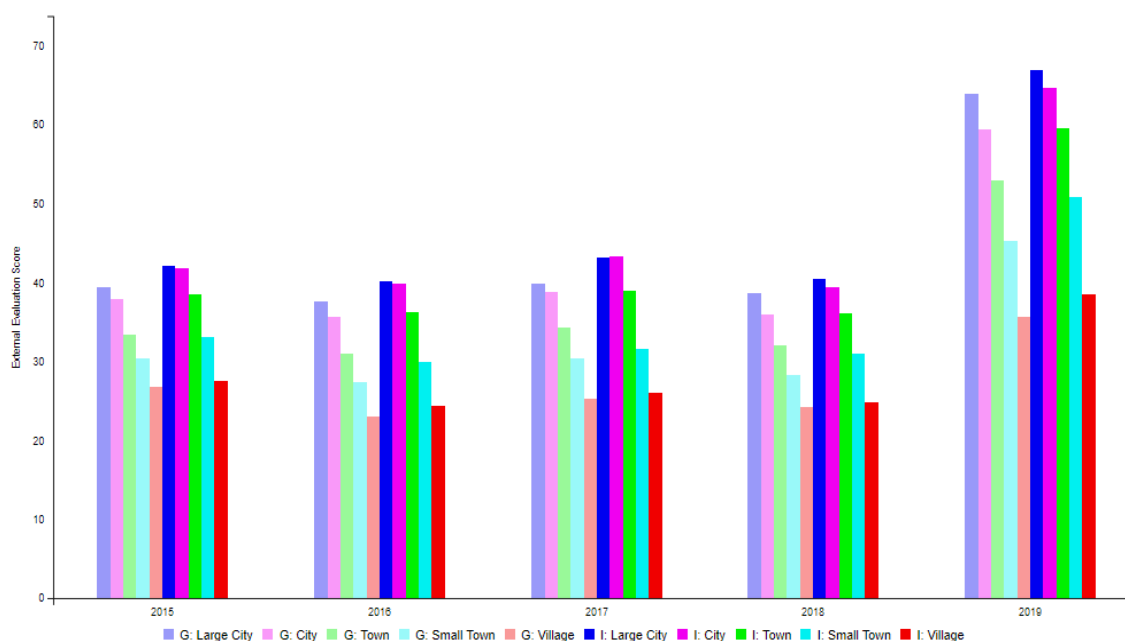- Innovative teacher qualification and cooperation.

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[7] Commission's Communication on Improving and Modernising Education (2016e)
[8] OECD 2015

Performance of Innovative Schools by location size (PISA): Bulgarian language and literature 2015-2019

National external evaluation after 7-th grade

Innovative schools have higher scores in places of residence of all sizes and the trend is sustained through the years for which data is available. The differences in the achievements between regular and innovative schools are the smallest in the smallest settlements but we should keep in mind that innovative schools there are very few. In conclusion, innovation is definitely a factor of quality in education.

There is also the question of an elaborate network of private lesson providers, which make it hard to distinguish between effective schooling methods and external sources. Various extra-school learning channels with high efficiency and popularity are also provided by the civil sector.

The meaning of a learning society

It is said that the learning society is a means to achieve the knowledge economy and is potentially the answer to most problems of the modern world. The knowledge economy is increasingly dependent on knowledge workers rather than traditional manufacturing industries, which needs the workforce to become adaptable, particularly in the light of new technological developments. The White Paper "Teaching and Learning: towards the learning society" (1995) of the European Commission treats capital investment and investment in training on an equal basis. A learning society regards the actual process of learning as an activity and not a place, meaning that it is taken outside regular educational institutions, decentralized and deregulated. The accumulation of interactions between individuals becomes social capital for the learning society to develop. It needs motivated, engaged learners, prepared to conquer the unforeseen challenges of today and tomorrow; recognizes that people learn differently and strives to meet those needs; cultivates and embraces new learning providers from all sectors.

The learning society is a goal, aligned with the two dominant conceptualisations of education that we described at the beginning of this paper – human development for social change, and efficiency and effectiveness. The progress toward this goal is heavily dependant on the quality of education. The Annual Reports of the Ministry of Education on the implementation of the National Life-Long Learning Strategy do not contain any analysis of the indicator for reducing the proportion of students with low educational achievements at the age of 15. This is another evidence of the futility of any on-going reforms, assuming any are being implemented.

It becomes clear though that initiatives of the "innovative school" type which prove effective need serious attention.

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