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## РОЛЬ МЕЖДУНАРОДНЫХ СРАВНИТЕЛЬНЫХ ИССЛЕДОВАНИЙ В РАЗВИТИИ КАЗАХСТАНСКОЙ СИСТЕМЫ ОБРАЗОВАНИЯ

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*Казахстанская система образования, как и многих других стран, на протяжении последних лет принимает участие в международных сравнительных исследованиях. Результаты данных исследований свидетельствуют о медленном и зигзагообразном продвижении казахстанского образования к улучшению качества обучения функциональной грамотности школьников. В данной статье мы попытаемся выяснить некоторые причины того, что полученные результаты пока еще ниже среднего показателя по ОЭСР. В этой связи среди многих факторов успешности/неуспешности казахстанских школьников в решении задач TIMSS и PISA мы выделили характер учебных материалов, которые, как правило, системно излагаются в учебниках. Исходя из этого, мы проанализировали содержание ряда учебников по математике, химии и биологии на предмет наличия в них заданий, направленных на формирование функциональной грамотности школьников. Мы полагаем, что в составе математических и естественнонаучных компетенций школьников функциональная грамотность занимает доминирующее положение.*

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*Такая исходная позиция для нашего исследования связана с тем, что на протяжении ряда лет Казахстан ориентирован на переход от знаниецентрированного образования к компетентностной парадигме обучения.*

*Ключевые слова:* образование, международные сравнительные исследования, парадигматическая трансформация, инновации, международная оценка учащихся, PISA, TIMSS.

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## THE ROLE OF INTERNATIONAL COMPARATIVE STUDIES IN THE DEVELOPMENT OF THE KAZAKHSTAN EDUCATION SYSTEM

### Abstract

*Kazakhstan's education system, like many other countries in recent years takes part in international comparative studies. As it is known, to improve the quality of education it is necessary to carry out continuous monitoring of the status and trends of its development, objective and adequate assessment of educational achievements of students. Especially it is important at the secondary level, laying the foundation for their further personal development and civic formation. Kazakhstan participation in the PISA study, TIMSS, PIRLS is dictated by a number of factors that lead to the need for reform the control and the evaluation of the education system: the integration of Kazakhstan education system into the world educational space, the implementation in Kazakhstan principles of the*



*Bologna process, the need to introduce international quality standards of education and control of the results, changes in the content of education, the construction of the Kazakhstan education quality assessment system.*

*The results of these studies indicate a slow and zigzag advancement of Kazakhstan's education to improve the quality of teaching functional literacy of students. In this article we try to find out some of the reasons that the results obtained are still below the OECD (Organization for Economic Cooperation and Development) average. In this regard, among the many factors of success/ failure of Kazakh students in solving problems of TIMSS (Trends in Mathematics and Science and Study) and PISA (Programme for International Student Assessment), we have identified the nature of study materials that tend to systematically set out in textbooks. Based on this, we analyzed the content of a number of textbooks in mathematics, chemistry and biology for the presence of these tasks, aimed at forming functional literacy of students. We believe that in the mathematical and natural scientific competences of students the functional literacy is in a dominant position. This starting position for our study is connected with the fact that over the years, Kazakhstan is focused on the transition from knowledge-centered education to competency paradigm of learning.*

*This allows more clearly define the goals of modern education policy, commensurate rate of educational progress in the world and in their own country, to track changes in the level of students' literacy in Kazakhstan over time to evaluate the factors that influence the results and the effectiveness of training and help in formulating recommendations and strategies to reform the education system in Kazakhstan.*

#### **Keywords**

*Education, international comparative studies, paradigmatic transformation, innovation, international student assessment, PISA, TIMS*

### **1. Introduction**

Head of the State, Leader of Nation, President of Kazakhstan Republic Nursultan Nazarbayev in his Address "Kazakhstan's way - 2050" has set the task of Kazakhstan's joining top 30 developed countries. At the same time he noted that "By 2050 purpose we will move in the difficult global competition ... There will not "Light walk" in the twenty-first century. Mid-century, is near. The developed countries of the world try on its specific strategies. The second third of the twenty-first century will be uniquely difficult, and the number of applicants in the global list of Top 30 – is very limited"<sup>1</sup>.

Reliable tool measurement tasks are the Global Competitiveness Index (GCI), which is determined annually by the World Economic Forum (WEF)<sup>2</sup>. It is known that in the literature there are many definitions of national competitiveness. According to some researchers this concept has a fairly broad scope of coverage and its very concept is not sufficiently clear. At the same time, the analysis of the problem showed that there are various aspects of this phenomena which should be taken into consideration as international cognitive ability of students personally and nation as the whole (Rindermann H.) [1], (Lynn R., Meisenberg G.) [2]; student

<sup>1</sup> Address of the President of the Republic of Kazakhstan, Leader of the Nation Nursultan Nazarbayev to people of Kazakhstan Strategy "Kazakhstan-2050". New political course of established state. *Kazakhstanskaya Pravda newspaper*. 2013, pp. 15–18.

<sup>2</sup> The official website of the Ministry of Economy and Budget Planning of Republic of Kazakhstan "On the results of the Global Competitiveness Index rankings of the World Economic Forum, 2011-2012 (Geneva, Switzerland)" Available at: <http://minplan.gov.kz/economyabout/568/39993> (accessed: 15.03.2016).

attainment (Goldstein H.) [3]; approaches to introduce the international exams (Jakubowski M.) [4], (Wu X.) [5]; experience of different countries in assessment (Egelund N.) [6], (Ertl H.) [7]; TIMSS, PIRLS and PISA in inclusive education (Schuelka M.) [8].

However, there is a steady trend over the recognition of the fact that competitiveness is indeed one of the fundamental problems of economic policy [9].

Does not aim to analyze definitions of these concepts, we proceed from the definition of the WEF, according to which national competitiveness is a set of political, economic and social performance factors. The World Economic Forum defines 12 such factors. At the same time there are three stages of development of the national economy:

1st stage – the stage of transition;

2nd stage – the stage of effective development;  
3rd stage – the stage of innovation development (Figure 1).

From the 12 factors listed in Figure 1, the formations of two are: primary education (the fourth component of the basic requirements) and higher education and training (the fifth component of the efficiency enhancers). This first one is measured by two indicators: "The quality of primary education" and "Coverage of primary education", and the second factor identified eight positions, "Coverage of secondary education", "Reaching higher education", "Quality of education", "Quality of teaching math and science", "Quality of management schools", "Internet access in educational institutions", "The availability of research and educational services", "Staff Development".

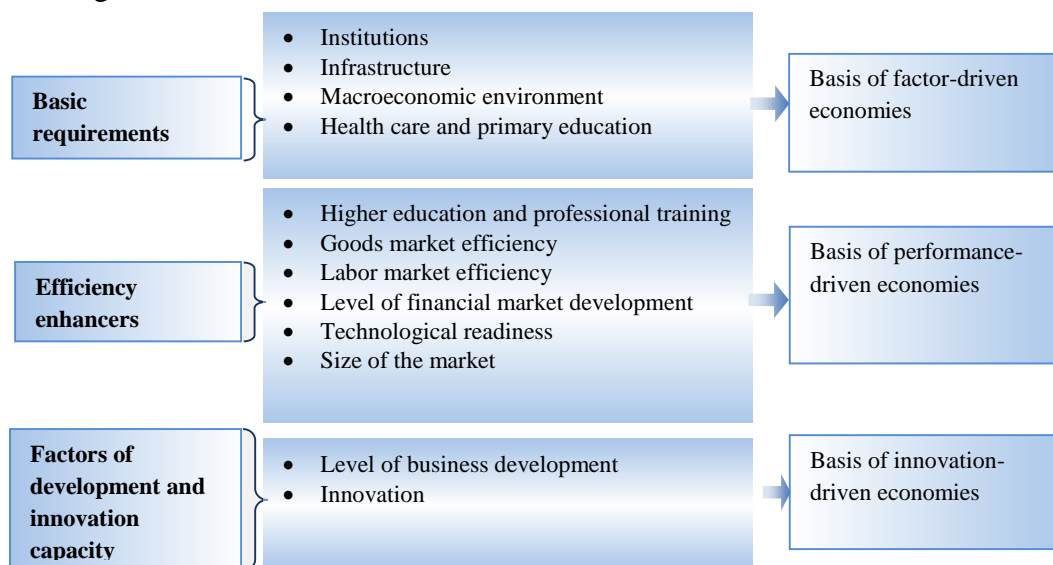


Figure 1. Indicators of GCI

In this rating Kazakhstan as a country with an economy in transition from stage 2 to 3, participates since 2013. In general, the dynamics of indicators of Kazakhstan GCI different dips to 2011. Since 2012, Kazakhstan's rating rose from 72 to 50 seats.

According to the report World Economic Forum (2014), improvement was observed in the group performance factors. Deterioration of 8 points observed by the factor of "Higher Education and Professional Training" (Figure 2).

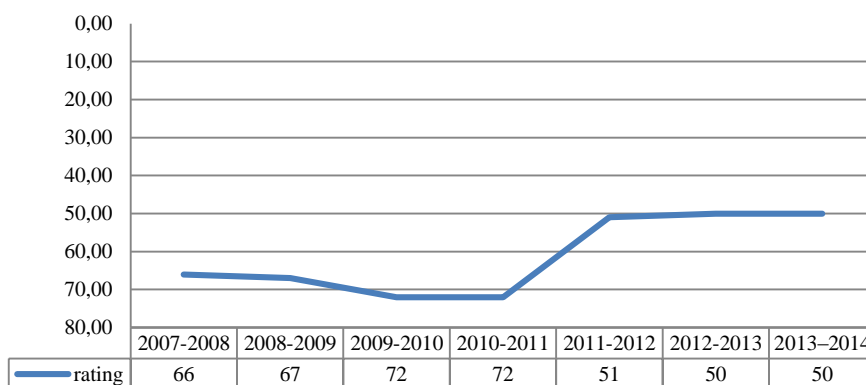


Figure 2. Dynamics of Global Competitiveness Index in Kazakhstan (in 2014) <sup>3 4</sup>

On this occasion, the Minister of Education and Science Aslan Bakenovich Sarinzhypov at a meeting of the Government of the Republic of Kazakhstan on the 4 November 2014 said that the statistics do not take into account children after grade 9 who go to college, so that to reach secondary education Kazakhstan occupies 42 place <sup>5</sup>. The same is true for coverage of higher education: the indicator does not take into account students' technical and vocational education (Kazakhstan colleges do not apply to higher

education). Here, Kazakhstan occupies 62 place. In addition, the Minister said that there is improvement in the country's position on the two indicators: "The quality of management schools" and "Staff Development" (Table 1).

Today, the world is committed to building a global education strategy. Implementation mechanisms of no small importance for today recognized international comparative studies, in particular, TIMSS and PISA.

Table 1.

#### Rating of Kazakhstan in GCI in 2014

Indicators of GCI	Rating of Kazakhstan
Secondary school enrollment	42d place
Reaching higher education	62d place
Quality of management schools	92d place
Staff development	62d place

<sup>3</sup> Kazakhstan and the Global Competitiveness Index. The official website of the International Institute of Modern Politics Available at: [http://www.iimp.kz/default.aspx?article\\_id=974](http://www.iimp.kz/default.aspx?article_id=974) (Accessed: 05.01.2016).

<sup>4</sup> Development of Natural Science literacy of pupils in the content of international study of PISA, TIMSS: manual/ Y. Altynsarin National Academy of Education. Astana, 2014, 40 p. Available at: <http://www.astana-bilim.kz/files/sites/1374125625025789/files/widgets/book-catalog/1415359856263837/ru/3.%20Estestvoznание%20TIMSS%20PISA%20008.pdf>. (Accessed: 05.01.2016).

<sup>5</sup> The meeting of the Government of the Republic of Kazakhstan on improvement of indicators of Kazakhstan in the WEF Global Competitiveness Index from November 4, 2014. Available at: <http://primeminister.kz/news/show/62/na-zasedanii-pravitelstva-rk-rassmotreny-voprosy-uluchsheniya-pokazatelej-kazahstana-v-globalnom-indekse-konkurentosposobnosti-vef-/04-11-2014>. (Accessed: 05.01.2016).



This is evidenced by the increase in the number of countries participating in the study PISA. If the first cycle of PISA–2000 was attended by only 32 countries, the forthcoming study PISA–2015 plan to take part 70 countries. CIS involves only two countries – Kazakhstan and Russia<sup>6</sup>.

For Kazakhstan participation in the study of PISA, TIMSS, PIRLS is dictated by a number of factors that lead to the need for reform of the control and the evaluation of the education system: the integration of Kazakhstan education system into the world educational space, the implementation in Kazakhstan of the principles of the Bologna process, the need of introduction of training quality international standards and monitoring of its results, changes in the content of education, the construction of the Kazakhstan system of education quality assessment<sup>7</sup>. For example, the international program TIMSS study aims which compare the quality of mathematics and science education in primary and basic schools. Research allows you to track trends in education of participating countries every 4 years, when students of 4th grade become the students of 8-th grade. Participation in such programs will raise the theory and practice of educational measurement in Kazakhstan to a higher level, to get a unique experience in the use of tools, created in accordance with international priorities in education, the most advanced procedures and technology research<sup>8</sup>. In turn, the PISA study conducted in mathematics, science, reading, problem solving and assesses students' ability to apply their knowledge in school and skills in life.

A key research question is: Do 15-year-old students who have received general compulsory education, have knowledge and skills that they need to function fully in society? At the same time, important indicators are: first, a person's ability to identify and understand the role of mathematics in the world to use mathematics in order to satisfy current and future requirements inherent in the thinking citizen; secondly, the ability to use natural scientific knowledge, identify problems and make informed judgments necessary for the understanding of the world and the changes that it makes to human activity; third, the ability to understand written texts, to use the content for their own purposes, the development of knowledge and opportunities for active participation in society (estimated at first understanding and reflection on the text, the use of reading for different purposes); fourth, the ability to use the knowledge and skills to solve real problems in which the way to solutions at a glance clearly determined.

As for the study of the quality of reading and understanding of the text, in this direction works program PIRLS, in which estimated are basically two kinds of reading, which most often used by students during school hours and outside school: reading to acquire literary experience and reading for mastering and using information.

## 2. Methodology and methods

Participation in international comparative studies allow to obtain external independent objective assessment of the competitiveness of national school systems on the basis of a

<sup>6</sup> Ibekova N.T. Enhancement of Kazakstan pupils' functional literacy. Educated country. *Republican educational socio-political newspaper* Astana, 2015, no. 20(33) Available at: [www.bilimdinews.kz](http://www.bilimdinews.kz) (accessed: 15.12.2015).

<sup>7</sup> State Program for Education Development of Kazakhstan for 2011-2020: accepted by the decree of

the President № 1118, December, 7 2010 Available at: [http://primeminister.kz/page/article\\_item-34](http://primeminister.kz/page/article_item-34). (accessed: 15.12.2015)

<sup>8</sup> Damitov B.K. [and et al.] National report on the status and development of education in the Republic of Kazakhstan. Astana, 2008, 260 p.



comparison with international best practices, which stimulates the improvement of national systems of education quality assessment. Based on the results of the international comparisons, policy in a number of countries are taking initiatives to reform educational systems [10].

The results of international rankings largely determine the nature of pedagogical innovations, so Kazakhstan's participation in research is very important. Not less important is the study and analysis of how the results of comparative studies, and the process of preparation for such studies. Note the preparation process can be a purposeful, i.e., "Point, relevant, fragmentary" and a system for the long term. In this sense, our research is aimed at identifying the real situation of preparedness students for international exams and on this basis, makes appropriate recommendations on the professional use of the results obtained in the previous stages. This will provide a critical understanding of the traditional ideas and the development of new constructs for further development.

While working on the article, we used the following set of research methods: analysis of textbooks, a sociological survey, comparative analysis, mathematical processing of statistical data.

### 3. Results and discussion

According to official sources, the study of TIMSS in Kazakhstan the first time was in 2007. Then only 4 grade students participated and in 2011 there were involved students of 8th form. Therefore, the dynamics of the indicators we have traced only in the context of 4th form. To identify the dynamics of the indicators we calculated the ratio of occupied positions of importance. For example, in mathematics boost factor was 7.2 in 2007 and 1.9 in 2011, 5th place from 36, while the growth rate was negative (-5.3), i.e., position Kazakhstani schoolchildren went on a sharp decline<sup>9</sup>. A smaller decrease was observed in the indicators for the natural sciences. Here, growth rate (-2.1) also is a negative number (Table 2, Figure 3).

Thereby, the second phase study participation TIMSS pupils of 4th form of Kazakhstan significantly lowered position in comparison with the results of the previous cycle.

In the PISA study, Kazakhstan participated twice – in 2009 and 2012. If the results of the PISA–2009 for Kazakhstan were disappointing, the PISA–2012 showed positive developments. But the results are still below the OECD average<sup>10</sup>.

Table 2.

Information on the rating of Kazakhstan in TIMSS (4 classes)

Disciplines	Rating		boost factor rating		growth rate in the rating
	2007 year	2011 year	2007 year	2011 year	
mathematics (MD)	5 from 36	27 from 50	7,2	1,9	-5,3
Natural Sciences (NS)	11 from 36	32 from 50	3,3	1,6	-1,7

<sup>9</sup> Beisen D. What to teach Kazakhstani students and how to improve the results of students in PISA-2015 [Electronic resource]. Access mode: <http://idea-lab.kz/idei/pisa/>

<sup>10</sup> Kultumanova A. [and et al.] Main results of an international study of educational achievements of 15-year-old students PISA-2012. Astana, NCEA Publ., 2013, 283 p.



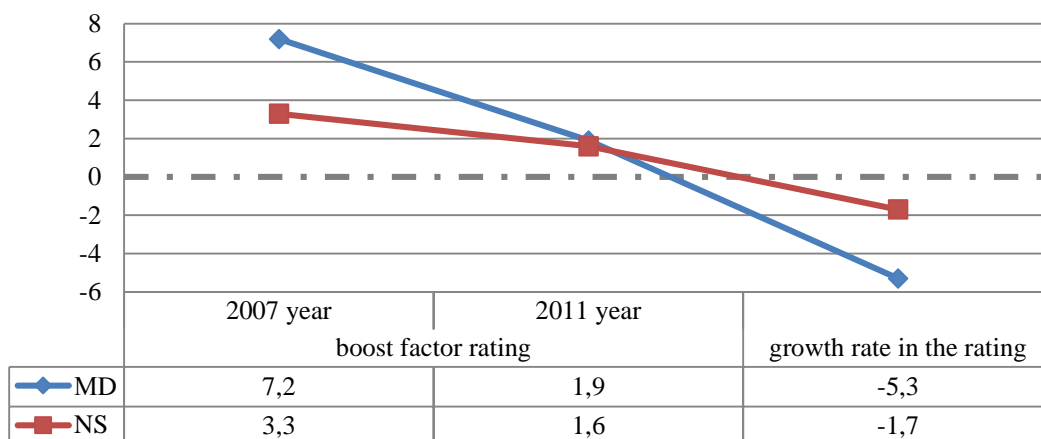


Figure 3. Dynamics of results in Kazakhstan in TIMSS (4 form)

In general, the comparative figures of 2009 and PISA–2009 and PISA–2012 are reflected in the materials of Table 3 and Figure 4.

Here, we have also identified the coefficient significance of the taken position where Literacy

reader observed negative value (-0.07) in the growth rate indicators. But on mathematical and scientific literacy of Kazakhstani students raised their rating of 0.1 and 0.13, respectively.

Table 3.

Information on the rating of Kazakhstan in PISA

Disciplines	Rating		Boost factor rating		Growth rate in the rating
	2009 year	2012 year	2009 year	2012 year	
Reading	59 из 65	63 из 65	1,1	1,03	-0,07
Mathematics	53 из 65	49 из 65	1,23	1,33	+0,1
Natural history	58 из 65	52 из 65	1,12	1,25	+0,13

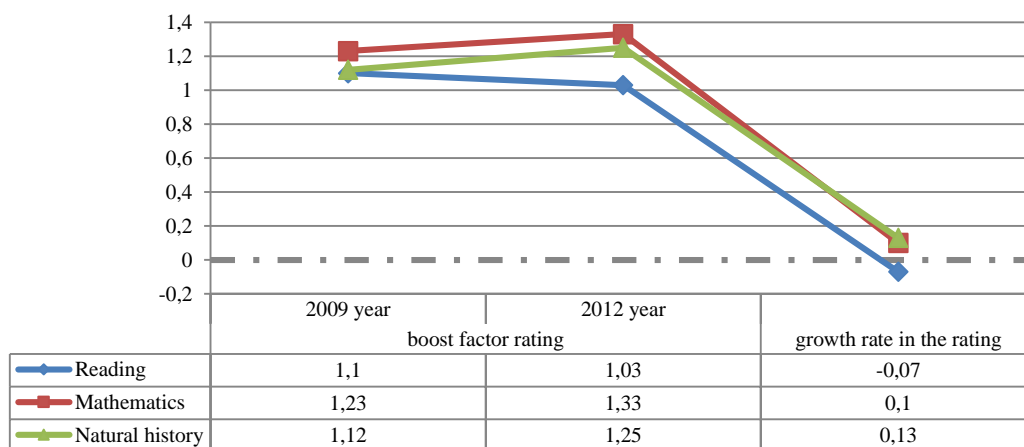
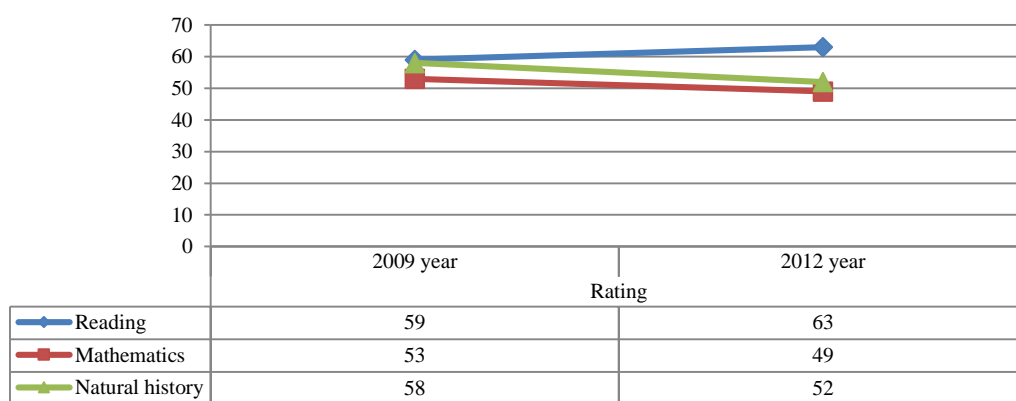


Figure 4. Dynamics of results of Kazakhstan in PISA

As the number of participating countries in 2009 and 2012 remained the same (65 countries), the identification of the dynamics of indicators of Kazakhstan we have reflected in the literal sense (see Figure 5). In general, our students receive strong subject knowledge, but often do not know how to apply them in life.

In order to determine the causes, we analyzed the quality of the training material, to be

precise, educational tasks. It is clear that the factors of success of training have a very wide range, in particular the relationship between teachers and pupils, motivation and self-esteem training, relevant to a particular academic subject [11], the cultural diversity of the community [12–13], language learning [14], form a relationship to the formation of a particular culture community [15].



**Figure 5.** Dynamics of results of Kazakhstan in PISA

But we are deeply convinced primary means of communication of teacher with the students are just learning tasks: the teacher creates the tasks, thinks the algorithm of implementation, and students do and performs these tasks.

With this in mind, we conducted an analysis of textbooks in chemistry and biology. The analysis was aimed at identifying the proportion of teaching jobs by the type of TIMSS and PISA (Table 4, Figure 6).

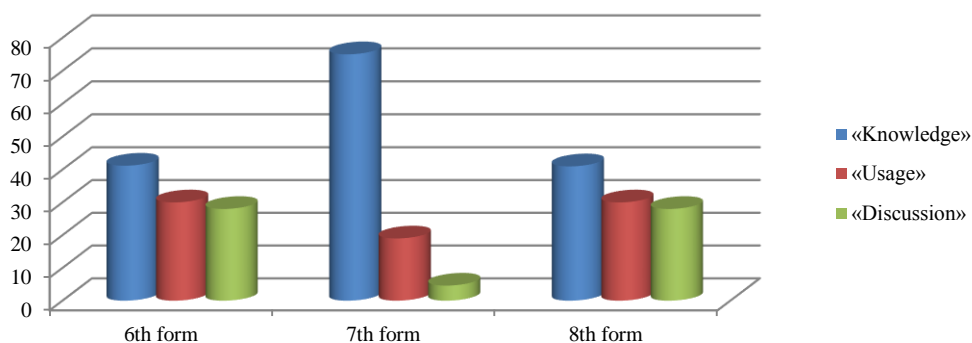
Table 4.

**Proportion of educational tasks by type TIMSS in biology textbooks (in %)**

	«Knowledge»	«Usage»	«Discussion»
6 <sup>th</sup> form	41,2	30	28
7 <sup>th</sup> form	75	19	4,6
8 <sup>th</sup> form	41	30	28

The histogram in Figure 6 shows a significant predominance of knowledge - component in the training materials which are not supported by the practical application of the knowledge. Particularly alarming situation is with the thrust of educational materials for the

development of reasoning and thinking abilities of schoolboys. At the same time there is the negative dynamics of indicators: the older class, the lower the proportion of learning activities for the development of scientific literacy.



**Figure 6.** Comparative data on the availability of jobs by TIMSS type in biology textbooks (in %)

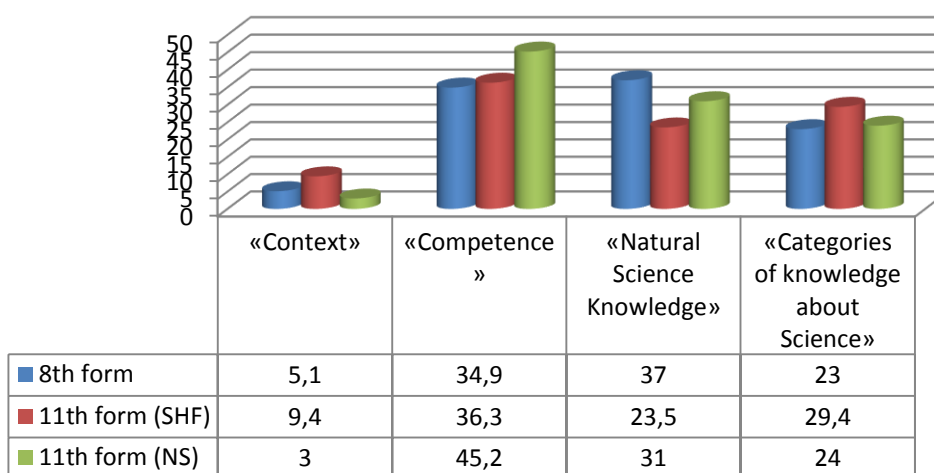
Approximately the same situation remains in educational material for chemistry.

For example, in chemistry textbook for 8<sup>th</sup> form<sup>11</sup> tasks of PISA type was 5.1 % in the part "Context"; 34.9 % in the part "Competence", 37 % in the part "Natural sciences" and 23 % in the part "Categories of knowledge about science".

In a chemistry textbook for 9<sup>th</sup> form<sup>12</sup> and in chemistry textbook for the 10<sup>th</sup> form as a social and humanitarian direction, and as a Natural and Mathematics<sup>13</sup> tasks of PISA type are used only

in certain subjects related to the study of the properties of metals and non-metals and their compounds, and is up 4.4 %.

In a chemistry textbook for 11<sup>th</sup> form of social-humanities<sup>14</sup> tasks of PISA type are 9.4 %; 36.3 %; 23.5 % and 29.4 % (respectively, the above sections). In a chemistry textbook for the 11<sup>th</sup> form of a Natural and Mathematics<sup>15</sup>, these tasks are made out 3 %; 45.2 %; 31 % and 2% respectively generalized indicators of PISA (Figure 7).



**Figure 7.** Percentage of educational tasks on PISA type in the textbooks of chemistry (in %)

<sup>11</sup>Chemistry: textbook for 8th form / N. N. Nurakhmetov [and et al.]. Almaty, Mektep Publ., 2012, 191 p.

<sup>12</sup>Chemistry: textbook for 9th form / N. N. Nurakhmetov [and et al.]. Almaty, Mektep Publ., 2013, 252 p.

<sup>13</sup>Chemistry: textbook for 10th form / N. N. Nurakhmetov [and et al.]. Almaty: Mektep Publ., 2014, 187 p.

<sup>14</sup> Chemistry: textbook for 11th form (social-humanities) / N. N. Nurakhmetov [and et al.]. Almaty, Mektep Publ., 2011, 179 p.

<sup>15</sup> Chemistry: textbook for 11th form (naturals and mathematics) / A. E. Temirbulatova [and et al.]. Almaty, Mektep Publ., 2011, 209 p.

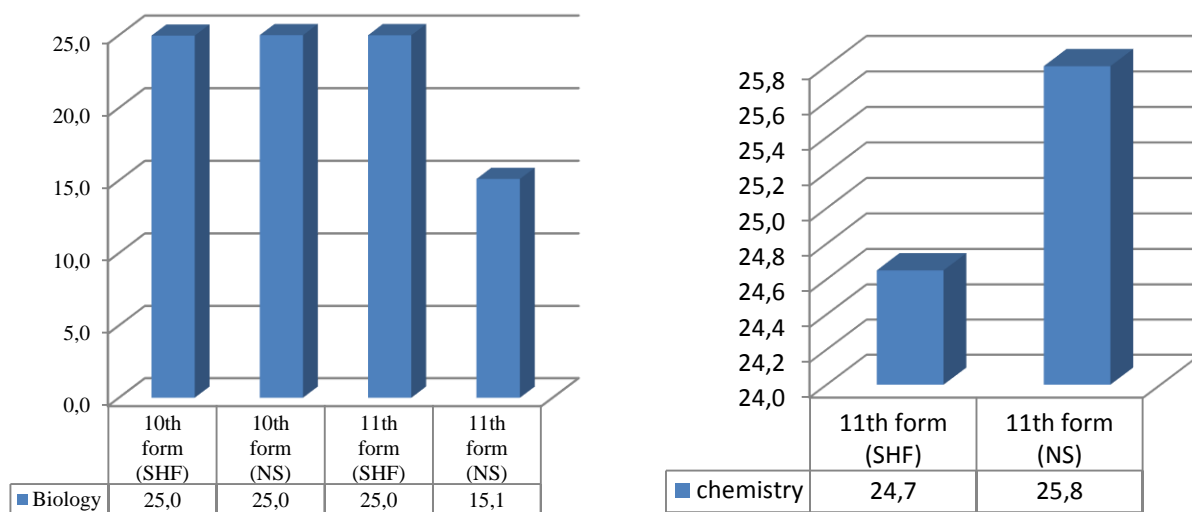
The above histogram shows that the situation of educational tasks aimed at creating scientific literacy in chemistry textbooks more comforting than the situation with biology textbooks, since in the first case, a certain percentage of jobs focused on the formation of natural "Competence" (there are more than tasks in the "Natural Science Knowledge"). However, the prevalence of job group "Categories of knowledge about Science" over the tasks of the "Context" suggests that a fundamental educational material than its application (practice-) character.

If we trace the proportion of learning activities which are focused on the formation of scientific literacy in the context of the two

directions (SHF and NS), in contrast to the textbooks on chemistry, biology textbooks show the ambiguity of fundamental differences of social and humanities education of natural science areas. This is especially true in biology textbooks for 11forms, where we have seen a sharp decline in the share of educational tasks aimed at the formation of scientific literacy of the students who choose this field of study (Figure 8).

It was found that in teaching materials knowledge component is predominant. Particularly alarming situation is with educational tasks for reasoning and thinking.

Overall, the analysis showed that the training material for the formation of scientific literacy is very low.



**Figure 8.** Percentage of learning activities focused on the formation of scientific literacy in the context of the natural sciences and the social and humanitarian fields of study (in %)

That is our textbooks on the chemistry and biology help to prepare poorly for the participation of Kazakh students in the research TIMSS and PISA. Clearly, the system of educational tasks – is not the only factor of success. It is important to be aware of these studies.

We conducted a snap poll among pupils, students and parents. And it turned out that our children have little or no idea of the TIMSS and PISA. Parents know more about it (Figure 9).

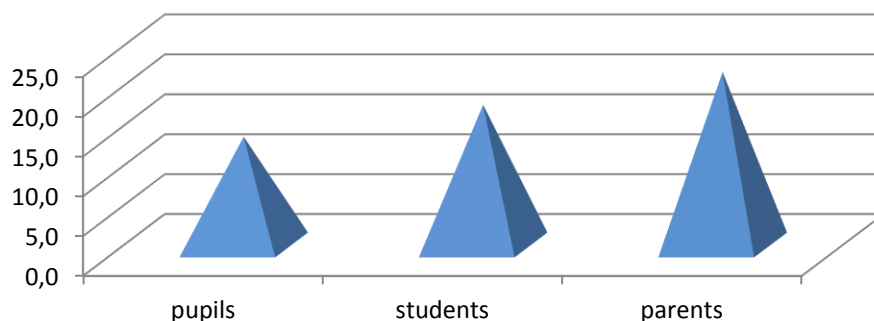


Figure 9. Indicators of awareness of international comparative studies of pupils, students and parents (in %)

The main source of information on the TIMSS and PISA are friends, in the second

position – the media, and educators take a third position (Figure 10).

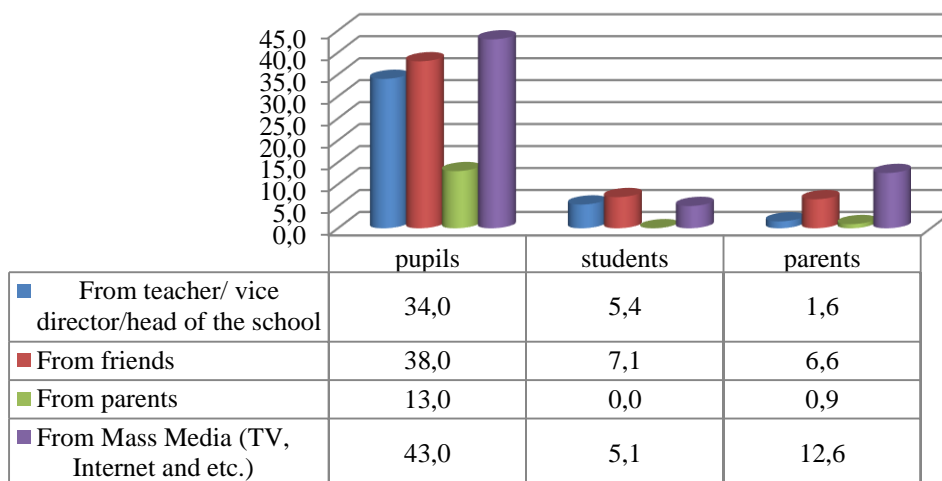


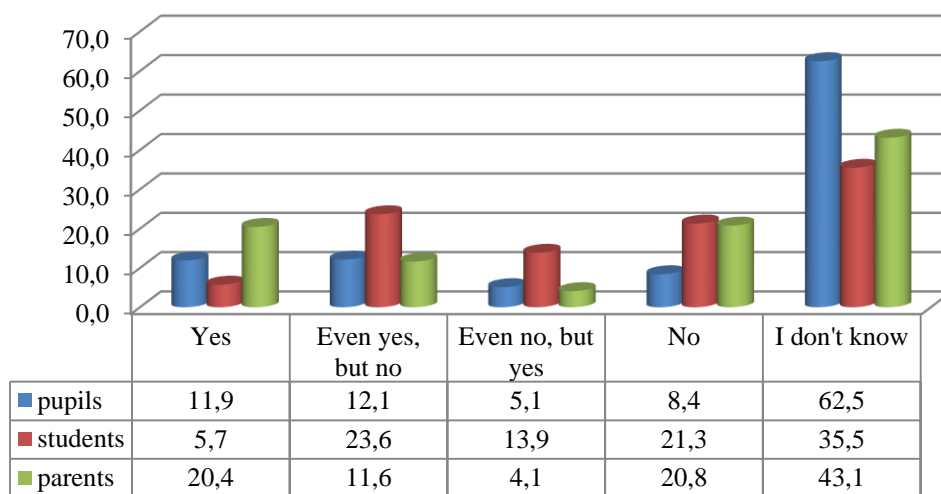
Figure 10. Information about the sources of information in the field of international comparative studies (in %)

As a consequence, the vast majority of respondents in all three categories, cannot judge the relevance of our participation in these studies and the importance of such participation to the country as a whole (Figure 11).

Overall, the analysis of the results of Kazakhstan's participation in the PISA–2009, PISA–2012, TIMSS–2011 revealed the following problems:

1 "Kazakhstan students have problems with the understanding of discontinuous texts using graphs and tables, and cannot correctly interpret formulated problem" (World Bank experts in the study of Program for International Student Assessment (PISA)).

2 "Analysis of the results showed that the problem with readers' skills of Kazakhstani students associated with an excellent understanding of the solid, classical texts, while there are problems with the understanding of discontinuous texts using graphs and tables. Students are able to remember and describe good information, but have difficulty with its generalization and with the ability to control the strategic reading. This problem can be solved by developing new curricula and standards" (consultant and expert in the assessment and monitoring of student achievement, the World Bank, Mark Selman).



**Figure 11.** Information on the understanding of the importance of Kazakhstan's participation in international comparative studies (in %)

3 "As a result of PISA–2012 it is clear that students are able to formulate the problem, but cannot interpret it correctly. At the same time nine out of ten OECD countries, by contrast, have the opposite tendency. We should think about how to build training programs so as to improve the results of Kazakhstan in the PISA–2015"(consultant and an expert in the assessment and monitoring of student achievement, the World Bank, **Mark Selman**).

4 "The teachers of secondary schools of the republic have strong subject knowledge, but do not learn to apply them in real-world, real-life situations" (conclusions of PISA–2009).

5 "Kazakhstan, along with countries such as China and Malaysia improve their results, but they are below the OECD average" (conclusions of PISA–2012).

#### 4. Conclusion

The results of Kazakhstan's participation in these studies have shown that there is an urgent need to improve the quality of education.

Therefore, updating of the content of secondary education is advantageously carried

out taking into account the requirements of international studies (PISA, TIMSS, PIRLS). This opportunity can be expanded in the formulation and solution of the following tasks:

1) Strengthen the content of natural science education programs in elementary and primary schools.

2) Start of work on the development of learning activities based on real-life situations; increase the number of tasks that simulate specific practical situations.

3) Insert the textbooks more tasks of practical content, tests in various formats, and interesting challenges to the application of knowledge in unusual situations.

4) Inform the public widely, parents and students about the importance and specificity of the international comparative studies.

5) Develop and publish guidelines on the use of the recommendations of international comparative studies, the collection of tasks.

6) Use a job to check the functional literacy of students in the framework of the final certification of pupils of 9 and 11 forms.



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