



# EDUCATIONAL STUDY OF THE QUALITY OF MATHEMATICS AND NATURAL SCIENCES IN PRIMARY EDUCATION INTERNATIONAL RESEARCH ON (TIMSS)

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## ABSTRACT

*The article discusses the international study of the quality of mathematical and Natural Science education (Trends in Mathematics and Science Study, TIMSS) — periodic monitoring of the quality and trends in the development of mathematical and natural science areas of national education systems.*

**KEYWORDS:** *TIMSS, mathematical literacy, natural science literacy, international studies, special document “TIMSS Assessment Frameworks and specifications”, requirements of the TIMSS standard, ETS.*

## INTRODUCTION

The International Monitoring of the Quality of School Mathematics and Science Education (English - TIMSS - Trends in Mathematics and Science Study) is a program organized by the International Association for the Assessment of Educational Achievement (IEA). This study will help to compare the level and quality of mathematics and science knowledge of primary education students in 4th grade and 8th grade in different countries and to identify differences in national education systems. This survey is conducted once in 4 years. It has been held 6 times so far. In 1995, 1999, 2003, 2007, 2011 and 2015. 3 times since 1995 (the last one in 2015), advanced research work (Advanced TIMSS) has been conducted, including determining the achievements of school graduates (11th grade in Russia, 12th grade in the USA). The main task of the TIMSS international survey is to provide a comparative assessment of the quality of mathematics and natural sciences education at the school. Every 4 years, the educational achievements of students of the 4th and 8th grades are evaluated, and at the same time, not only their knowledge and skills, but also their attitude to these subjects, their interest, and their interest in education. allows to compare the motivation of The main design of the study: for 4 years, the results of the 4th grader’s knowledge of mathematics and natural sciences will be monitored until he reaches the 8th grade. In this regard, monitoring of educational achievements of elementary and high school students is carried out.

## ANALYSIS OF LITERATURE ON THE TOPIC

Our initial literature is called “The role and importance of TIMSS international research in the life of our country.” This book was developed as a methodical guide for primary school teachers, methodologists and experts in the field. The reasons why the Republic of Uzbekistan entered the field of education were mentioned. This study is planned for 2023, and our country is participating in this project for the first time is enough. Therefore, it is necessary to prepare for it with special enthusiasm. Because developed countries have a high index in international studies. It can be used by teachers of mathematics, methodologists and experts in the field as a methodical guide. This book contains mathematical problems, their solutions and stages of logical thinking. The study guide on the assessment of students’ reading literacy in international studies serves as a methodical guide for teachers of the native language and literature, and specialists in the field.

## RESEARCH METHODOLOGY

The TIMSS program launched its first survey in 1995 and has been conducted every four years until 2019 in 1999, 2003, 2007, 2011, 2015 and 2019. The next 8th cycle is planned to be implemented in 2023. In 2015, 57 countries participated in the TIMSS survey, and in 2019, this figure increased to more than 60 countries. According to the results of the TIMSS 2015 study, the educational system of countries such as the USA, Singapore, Hong Kong, the Republic of Korea, Japan, Russia, and Great Britain had the highest indicators. Currently, the development of the national innovation system and improvement of innovation potential are considered the most important factors of the country’s economic growth. Therefore, the problems of researching these factors are relevant for many countries and international organizations of the world. In this regard, it is of great importance to have an evaluation system designed to quickly and reliably analyze the level of innovative development. International rating systems created by reputable international organizations are used as such rating systems. In the research countries, the content of mathematics and science education in schools and the educational process, factors related to the educational institution, teachers, students, and their



families are further studied. In addition to the international test, the school administration, students and teachers participating in the study will be surveyed. The obtained data will help to determine the factors affecting the test results, that is, the knowledge of students, and to show the state of mathematics and natural sciences in the countries participating in the research. Many scientific research centers and professional organizations of the world participate in conducting this research and developing the complex. Educational testing services: (ETS- Educational Testing Service SShA), Statistics Canada, Secretariat of the International Association for the Evaluation of Educational Achievement (IEA, Netherlands), the International Association for the Evaluation of Educational Achievement data center (DPC IEA – Data Processing Center IEA, Germany) and so on. In order to strengthen the coordination of experts from different countries, advisory committees consisting of the world's leading experts were established. The current study is coordinated by the International Coordinating Center at Boston College. (ISC – International Study Center, Boston College SShA) In Russia, this study (the center for the assessment of the quality of education) is carried out by the Institute of Science, the Essence and Method of Education of the Russian Academy of Education, as well as the Ministry of Science and Education and the educational management bodies of the regions. A special document “TIMSS Assessment Frameworks and Specifications” was taken as the basis for the development of TIMSS research, in which, with a general approach to these directions, an understanding of tests and test tasks in mathematics and natural sciences is given, as well as all types of learning activities are shown when the student performs the task. The information received during the survey will show the listed types of tariffs and tasks given to the student, teacher and educational institution. The TIMSS survey of math and science assessments is a valuable resource for monitoring educational effectiveness because science, technology, engineering, and math, commonly known as STEM, is a major focus of the curriculum. Obviously, even today, many jobs require a basic understanding of mathematics and natural sciences, and this will not lose its relevance in the future. Those working in STEM professions are responsible for finding solutions to world problems such as fighting hunger and habitat loss, as well as supporting growth and stability in the global economy. Also, mathematics and natural sciences are the basis of everyday life. The natural sciences are nature, including our weather, land and water, food and fuel sources. Mathematics helps us perform everyday tasks and is important in creating the technologies we rely on, such as computers, smartphones, and televisions. The global resource for determining the level of knowledge, skills, and qualifications of students in more than 60 countries was developed on the basis of the world's most advanced experience. Using TIMSS, students' educational achievements are assessed: **knowledge, application, reasoning**.

**The “Knowledge”** section includes solving problems in mathematics, solving problems requires students to have theoretical knowledge about the properties of numbers and simple geometric objects, repeating definitions, standard graphs and includes drawing information from diagrams. Students learn about the properties, events and processes of individual organisms and objects from natural sciences, must demonstrate knowledge of scientific terms and units of measurement.

**“Application”**, students need to demonstrate the ability to solve mathematical and natural-scientific problems that reflect life situations, interpret tables, schemes, diagrams, graphs, and conduct experiments. Tasks related to **“reasoning” determine students' logical and systematic thinking skills**. Issues requiring consideration are suggested can be distinguished from each other by the novelty of the situation, the complexity of the question, the large number of solving steps, the need to integrate knowledge from different departments.

## ANALYSIS AND RESULTS

TIMSS & PIRLS Center for International Studies Technical Report on the Methods and Procedures Used to Develop, Implement, and Report Results of TIMSS 2019 (Michael O. Martin, Mathias von Davier, and Ina VSMullis) is the first step in the transition to TIMSS 2019 because there were various technical difficulties. According to eTIMSS, about half of the countries administer the assessment via computer, while the rest use a paper-and-pencil format. Thus, TIMSS 2019 assessments and questionnaires have been developed and administered in e- and paper formats. Subsequently, a multivariate approach to achievement scaling allowed us to report comparable trends for both sets of countries on the TIMSS scale. The success of TIMSS 2019 is a credit to all participants, including the TIMSS & PIRLS International Study Centre, IEA Amsterdam, IEA Hamburg, Statistics Canada, and the National Research Coordinators and their teams in the participating countries. Now in its eighth cycle, TIMSS (Trends in International Mathematics and Science Learning) provides nearly 30 years of trend data on student achievement in mathematics and science. TIMSS 2023 completes the transition of TIMSS to digital assessment that began with TIMSS 2019, reflecting the widespread use of technology in schools and society makes TIMSS 2023 assessments include new and engaging item formats, interactive features, and scripted problem-solving and inquiry tasks that engage learners and utilize the digital environment. Also, in the TIMSS study, students, their parents or guardians, teachers, and school principals are asked to fill out questionnaires about their activities at home and at school, as well as the conditions for learning mathematics and natural sciences. The questionnaires are developed according to a carefully developed scope, which is developed by the TIMSS National Research Coordinators and the international experts of the TIMSS Questionnaire Review Committee. updated at each assessment through iterative reviews by This data from surveys can suggest ways to improve education and raise important issues about educational policies and practices creates an idea about its implementation. TIMSS research focuses on systematic assessment of learning dynamics, issues that arise in content areas and contexts for learning, and effective methods and activities are important for educational decision-making in participating countries. Contextual questionnaire scales can be used in conjunction with the mastery data obtained in the TIMSS study to:



- monitoring the system-level development dynamics in the global context;
- Using TIMSS research results to inform education policy makers and monitor the effectiveness of new or revised policies;
- Identify any areas of low performance and encourage curriculum reform;
- to observe how the fourth grade cohort of the previous term performs in the eighth grade of the next term;
- obtain important information about students' learning of mathematics and science in relation to home and school learning and teaching settings.

## CONCLUSIONS AND RECOMMENDATIONS

The theory of test tasks is used in the assessment of 4th and 8th grade students in mathematics and natural sciences (English, Russian). This theory includes a limited number of 60-70 tasks and determines the performance (based on the questionnaire) of the participating student, teacher and educational institution from each country. The results of mathematics and natural sciences are studied and analyzed separately in the 4th and 8th grades. As a result of statistical studies, each student is evaluated on a scale of 1000 points, and separate points are given to mathematics and natural sciences. In 1995, international scales were established in the 4th and 8th grades. The average score of the countries participating in the study was considered to be 500 points. The results of the next study are set according to the 1995 scale, which helps to compare the results and determine their changing trends. In conclusion, by participating in TIMSS and other international studies, Uzbekistan can use the experiences of developed countries in the educational system of Uzbekistan application, will have opportunities to compare their results with the results of other countries.

## REFERENCES

1. IEA, TIMSS&PIRLS International Study Center, Boston. College, 2005. 28. TIMSS 2007 Encyclopedia: A Guide to Mathematics and Science Education around the World 22 pages.
2. Krasnyanskaya K.A., Rydze O.A. Innovative tasks in mathematics for elementary school and international research TIMSS // *Otechestvoennaya*, page 25.
3. Kovaleva G.S., Results of the international study TIMSS -2011 // *Voprosy obrazovaniya*, 2012.
4. Blum, W., & Ferry, RB (2009). *Journal of Mathematical Modeling and Application*, 1(1), 45-58.
5. Gerdes, P. (1996). *Ethnomathematics and Mathematics Education*. In BISHOP, AJ et al. (eds.). *International Handbook of Mathematics Education*. Kluwer Academic Publishers, Dordrecht/ Boston/ London, 909-943.
6. Grønmo, LS, Kjærnsli, M., & Lie, S. (2004). Looking for cultural and geographical factors in patterns of response to TIMSS items. In C. Papanastasiou (Ed.), *Proceedings of the IRC-2004 TIMSS (Vol. 1, pp. 99-112)*. Nicosia: Cyprus University Press.
7. Mullis, IVS, Martin, MO, Foy, P., & Arora, A. (2012). *TIMSS 2011 International Results in Mathematics*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.
8. Assessment of students' mathematical literacy in international studies. (Methodological manual for teachers of mathematics, methodologists and experts in the field) "Sharq" publishing-printing joint-stock company, Chief editor. Tashkent-2019.
9. Decision of the Cabinet of Ministers of the Republic of Uzbekistan. "In the public education system.
10. on measures to organize international studies in the field of education quality assessment" No. 997 08.12.2018. //http://lex.uz/docs/4097073
11. http://timssandpirls.bc.edu website – TIMSS & PIRLS International Study Center.
12. https://www.timss.org/