Volume 2, Issue 6, June - 2024 **ISSN (E):** 2938-3803

THE METHODOLOGY OF DEVELOPING CREATIVE THINKING IN 4TH GRADE STUDENTS BY COMPLETING TIMSS TASKS

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Abstract:
The relevance of this article lies in how the state of a fourth-grade student and his psychological feeling changes in mathematics and science lessons, in which students complete TIMSS tasks (especially the mathematical part). Attention is paid to the popular issue of revealing the essence of the most international assessment study of comparative analysis of TIMSS in modern society and in the dominant world powers - the leaders of international research, their merits in their contribution to education and the restructuring of the process, in which special emphasis is placed on the comprehensive development of the personality of a primary school student and his cognitive abilities. The article also describes the results of the TIMSS study and its impact on the development of creative thinking in primary school students. The structure of TIMSS test items is discussed, divided into separate blocks “Knowledge”, “Application” and “Reasoning”. This article is relevant for teachers, educators, and students of primary education.

Keywords: thinking, test questions, international research, differential approach, block, educational environment, primary school student, primary education.

Introduction

For a complete understanding the essence of the impact of TIMSS assignments on the thinking of elementary school students, it is necessary to characterize the concept of "thinking". The term is interpreted as awareness of all perception from the environment in its various manifestations itself, namely, the creation of ideas about the subject and phenomena, the search for logical connections between them and solving problems with the ability to abstract. In the lessons, the teacher can develop thinking in different ways and methods, whether it is a didactic game, a competition or individual tasks.[4] At the same time, the structure of TIMSS test questions can incorporate all these aspects. Therefore, the lesson, by using the tasks of the international TIMSS study, has the opportunity to stimulate the creative thinking of fourth grade students.

This study provides an opportunity to compare the level of mathematical education and knowledge in the field of natural sciences among fourth- and eighth-grade schoolchildren in different countries. TIMSS questions and test tasks are based on the following components: [2]

- tasks and information based on educational and cognitive activities;
- similar content of tasks in the countries which participating in the study;
- control of information in the mathematical and natural science blocks;

Web of Humanities: Journal of Social Science and Humanitarian Research

Volume 2, Issue 6 June - 2024 **ISSN (E):** 2938-3803

• compliance with the age capabilities of the participants and the test questions provided.

During teaching primary school students, it is important to correctly select and use methods, means and forms of pedagogical technologies in order to expand the horizons of students, their creative abilities. A number of innovative technologies are used in organizing educational activities.

The concept of TIMSS (from English Trends in Mathematics and Science Study) is an international study of the quality of mathematical and natural science education in schools and an analysis of the results between different countries of students in 4th and 8th grades. This is a program organized by the International Association for the Evaluation of Educational Achievement (IEA). [1]

This decision was made in order to improve the techniques and methods used in mathematics and natural science lessons after an in-depth analysis of the results of schoolchildren who participated in the monitoring. A number of studies have been conducted in this area. The acquisition of skills for solving TIMSS-type tasks depends on the methodological literacy of the primary school teacher, on his or her understanding of the importance of exercises for the formation of mathematical concepts and other theoretical provisions in mathematics lessons, so it is necessary to correctly select tasks, taking into account their semantic load. The definition of the importance of TIMSS tasks in mathematics lessons as an innovative approach of teaching is devoted in the works of K.A. Krasnyanskaya, O.A.Rydze and others.

The TIMSS structure assesses the educational achievements of schoolchildren in such cognitive blocks as "Knowledge", "Application" and "Reasoning". The "Knowledge" area includes problems in mathematics that require the student to know the properties of numbers and simple geometric figures, reproduce definitions and obtain information from standard graphs and diagrams. In the natural sciences, it is necessary to demonstrate the level of knowledge about the properties of individual organisms and materials, phenomena and processes, natural science terms and units of measurement. During completing tasks for "Application", schoolchildren must demonstrate their ability to solve mathematical and natural science problems related to various life situations, interpret data from tables and diagrams, graphs, and conduct experimental work.

The "Reasoning" block reveals the logical and systemic thinking skills of students. Problems requiring reasoning may differ from each other in the novelty of the proposed situation, the complexity of the question, the number of solution steps, and the need to integrate knowledge from various sections. The purpose of this program is to assess students receiving general compulsory education in the skills and knowledge obtained in this period and serving for full functioning in society. [1]

First of all, it is necessary to remember that the current 21st century is the century of information technology and robotics, which serves the development of not only the skills described above but also the ability to use computer technology. And modernity requires from specialists competencies that are completely different from the previous ones. If previously a strong memory, encyclopedic knowledge, professionals who knew as much information as possible in their field were highly valued, now these skills are no longer of primary importance. After all, electronic search engines, online encyclopedias, various online databases by industry have already been created, and now the need to remember this information has faded into the background.

Tests according to the TIMSS system are conducted in order to identify current changes in the

Web of Humanities: Journal of Social Science and Humanitarian Research

Volume 2, Issue 6, June - 2024 **ISSN (E):** 2938-3803

education system, to determine to what extent schoolchildren have the skills of analytical thinking, draw conclusions and communicate based on real events, as well as how well the education system adapts to these changes. It is envisaged that the results will make it possible to objectively assess the level of development of education in the country and take timely solutions to eliminate existing shortcomings. [3]

In particular, to improve the quality and effectiveness of primary education, a broad world of thinking with a developed worldview is needed, in which each student can see with his own eyes the fundamental changes taking place in our society, express his attitude to each issue that he or she conducts. One of the most important tasks facing the teacher is the interconnection of learning, taking into account the individual characteristics of the student, his preferences in professions, various disciplines, which is covered by the structure and specificity of TIMSS tasks.

For the gradual introduction of this practice into the educational process, the teacher must gradually introduce similar tasks, as in the international TIMSS testing, between the completion of lesson assignments in mathematics and natural sciences. [1] And it should start in elementary school, so that by the eighth year of study, students have formed the necessary competencies that meet international educational standards.

The results of the study showed that with the introduction of TIMSS test tasks in mathematics lessons, students experience the development of:

- independent thinking;
- logical thinking;
- critical thinking;
- quick acquisition of material;
- worldview;
- memory.

According to the structure, the tests in the mathematics and natural sciences block in the fourth grade include 175 and 172 questions, respectively. Each booklet consists, on average, of 44-50 tasks, 72 minutes are allocated for this. In this regard, the primary school teacher can use these tasks during the educational process, integrating with the capabilities of students and their individual abilities. Thus, it is also necessary to involve students in time frames, that is, to determine the beginning and the end of the tasks. The uniqueness of such tasks serves to increase the creative thinking of schoolchildren and awaken interest in mathematics and natural science lessons, and this also serves as a good example of individually selected tasks tailored to the students' academic performance in mathematics lessons.

The main sections that the teacher needs to pay attention to are the "Numbers" block. It includes: the ability of understanding the meaning of numbers, decimal or common fractions, writing multi-digit numbers, basic skills in using natural numbers, ways of representing them, establishing connections between them, performing arithmetic operations and much more. During completing such tasks, students need to understand the relationship between units of measurement, convert one unit of measurement to another. [1]

For full immersion in the environment of the international TIMSS study, a questionnaire should be conducted in the classroom (students, teachers, parents, school administration). The data obtained can serve as a good source for identifying factors that affect the test results and explain the state of knowledge of schoolchildren in mathematics and natural sciences. It is also appropriate

Volume 2, Issue 6 June - 2024 **ISSN (E):** 2938-3803

to use modern information technologies along with TIMSS tasks during the educational process. The results of international studies assessing the quality of national programs show that countries such as Singapore, Finland, South Korea, the USA, etc. show the best result compared to other countries of the world. Singapore occupies a special place. The structure of education in Singapore is significantly different, which makes this country a leader in this environment. [5] For example, the educational environment is focused on practical significance, going back to the pedagogical traditions of many countries in the East and West. It mainly focuses on the individual curriculum prepared by the teacher, educator, the transfer of acquired knowledge to students and the direct preparation of schoolchildren for annual exams at the end of the year, to identify deficiencies, eliminate them and move on to a new level of education. Textbooks are developed independently by the teacher based on the psychological and physical data of the students of the school. The same is true for the curriculum, workbooks, methods, and so on. Singapore teachers focus on algorithms and sequences for solving problems and teaching the formulation of the problem from the side of accuracy and clarity. [5] In this state, a centralized teaching model still exists today. Where the teacher plays an important and main role in the lesson. When compiling TIMSS assignments, the teacher must take into account the following factors, which help to form a complete picture when selecting certain assignments for fourth-grade students:

- precise interaction of the principles of checking the content of tests;
- the significance of the tested material from the point of view of mathematical and natural science education;
- compliance with the age and psychological capabilities of children.

To assess the mathematical training of schoolchildren, tasks of different types are prepared such as: open, closed tests, with a choice of several answers, with a short or full detailed answer, practical tasks on logic and thinking. For a better assessment, it is appropriate for a teacher to use a differential approach, when there are four levels of academic achievement: low, medium, high and highest. Time frames that do not exceed what is permitted are also important.

When teaching primary school students, it is important to select and use methods correctly, means and forms of pedagogical technologies in order to expand the horizons of students, their creative abilities. When organizing classes, a number of types of innovative technologies are used.

It can be concluded that this approach can develop the thinking of schoolchildren during the educational process. With the correct use of innovative approaches to organizing mathematics lessons in elementary grades using TIMSS tasks, the effectiveness of information acquisition increases along with interest in the subject.

A mathematics lesson in elementary school in its content serves as a comprehensive developmental tool for the thought, worldview, speech of students, the personality of the child, and occupies an important place among other academic subjects. In the process of mathematics classes, the mathematical literacy of students is improved. The development of creative thinking during mathematics lessons, the development of methodological foundations for the practical application of specific forms and methods of using innovative approaches to organizing mathematics lessons in elementary grades, as well as the preparation of methodological recommendations: all this serves as a good foundation for building a comprehensively developed student.

Of course, there are special conditions, under which these results can be achieved. They are as

Volume 2, Issue 6, June - 2024 **ISSN (E):** 2938-3803

follows:

1) the use of innovative approaches to organizing mathematics lessons in elementary grades is theoretically and practically justified;

2) new approaches to organizing mathematics lessons in elementary grades using specific content, form, means, methods and techniques of TIMSS are justified;

3) the educational process aimed at using innovative approaches to organizing mathematics lessons in elementary grades, when the educational process is organized on the basis of specific scientific and methodological recommendations. The expected effectiveness is achieved in the process of primary education.

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