Pedagogical Cluster- Journal of Pedagogical Developments
PCJPD: Volume 2, Issue 1, January 2024, online: ISSN 2956-896X

PEDAGOGICAL CLUSTER
JOURNAL OF PEDAGOGICAL DEVELOPMENTS

Website: https://euroasianjournals.org/index.php/pc/index

Formation Of Students' Ability To Complete Tasks In Mathematics And Natural Sciences In Secondary Schools

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Annotation. This article provides information about the exercises of schoolchildren in the textbook “chemistry”, as well as in classes on the integration of natural sciences based on improving literacy in accordance with the international assessment programs TIMSS, taking into account the possibility for students to understand knowledge in mathematics and natural sciences based on creative thinking with the help of new ideas and ideas.
Keywords: international assessment programs, TIMSS international assessment program, integration.

Umumiy O‘Rta Ta’lim Maktablarida O‘Quvchilarning Matematika Va Tabiiy Fanlar Bo‘Yicha Topshiriqlarni Ishlash Ko‘Nikmasini Shakllantirish

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Nizomiy nomidagi Toshkent davlat pedagokika Universititeti
“Kimyo va uni o‘qitish” metodikasi p.f.d. DSc, dotsent v.b.

Annotatsiya. *Ushbu maqolada maktab o‘quvchilarining “Kimyo” darsligidagi mashqlar hamda tabiiy fanlar integratsiyasi asosida o‘tkasiladigan mashg‘ulotlarda TIMSS xalqaro baholash dasturlariga oid savodxonlikni oshirishga asoslangan, o‘quvchilarda matematikaga va tabiiy fanlarga oid bilimlarni yangicha g‘oya va fikrlar orqali kreativ fikrlash asosida tushunish imkoniyati xususida ma’lumotlar keltirilgan.*
Kalit so‘zlar: *Xalqaro baholash dasturlari, TIMSS xalqaro baholash dasturi, integratsiya.*

Формирование Умения Учащихся Выполнять Задания По Математике И Естественным Наукам В Общеобразовательных Школах

Аннотация. В данной статье представлена информация об упражнениях школьников по учебнику “химия”, а также на занятиях по интеграции естественных наук, основанных на повышении грамотности в соответствии с международными оценочными программами TIMSS, с учетом возможности понимания учащимися знаний по математике и естественным наукам на основе творческого мышления с помощью новых идей и идей.
Ключевые слова: программы международной оценки, программа международной оценки TIMSS, интеграция.

Introduction

In order to realize the goal of forming creative ideas, high knowledge and skills of the young generation who are our future successors on the path of rapid

development of our country, advanced foreign experiences, comprehensive analysis of the existing system, scientific research of the countries of the world Cooperation with institutions and using their experiences in the educational system will give effective results [1].

The ability of students to apply their knowledge in practice, together with the formation of their scientific literacy, leads to the development of their intellectual potential. Because the upbringing of a mature generation is the main priority of any country. In this regard, President Shavkat Mirziyoyev said: "Now that our country has entered a new period of its development, on the basis of the Strategy of Actions on the five priority directions of the development of the Republic of Uzbekistan in 2017-2021, large-scale in all fields changes are being made. The success of these reforms and our country's rightful place among the developed and modern countries in the world is first of all linked to the development of science and education, and our ability to compete on a global scale in this regard.

In fact, in order to ensure the development of the new Uzbekistan in the future, today's generation must have both spiritual and intellectual potential [2]. Science teachers have not yet fully mastered the concept of science teaching, which leads to the formation of students' mathematical and natural-scientific literacy. Therefore, it must be reformed, because science literacy is the main goal of education for the reform of science education. In short, the results of research on teaching mathematics and natural sciences in our country, the issues of comparing the methods of school teachers with the methods of teachers of foreign countries are considered and researched [3].

Literature Analysis and Methodology

TIMSS is a system aimed at evaluating the achievements of 4th and 8th grade students in mathematics and natural sciences, implemented by the International Association for the Evaluation of Achievements in the Educational System. In addition, the platform is based on measuring and describing differences in national education systems to help improve teaching and

learning. Assessment criteria used in the Trends in International Mathematics and Science Learning (TIMSS) tasks are studied to assess student performance in mathematics and science [4].

TIMSS (Trends in International Mathematics and Science Study) is a system for assessing the level of learning in mathematics and natural sciences [5]. It allows to determine and compare the level and quality of teaching mathematics and natural sciences of high school students in different countries of the world, as well as the changes taking place in the national education system. TIMSS aims to effectively measure academic achievement in mathematics and science in fourth and eighth grades, and sometimes in the final year of high school [6]. The research is designed to cover the breadth and richness of these subjects as they are taught in the participating countries. The study collects detailed information on curriculum and curriculum implementation, and empirical data on contexts for school education [7].

TIMSS assessment uses national curricula as the main organizing concept. The assessments are based on a comprehensive framework developed in collaboration with participating countries to describe the knowledge and skills expected of students in grades four through eight.

Evaluation criteria in TIMSS assignments: [8]

The TIMSS assessment system is designed to assess students' knowledge, skills and understanding in mathematics and science. The evaluation criteria in the TIMSS tasks correspond to the cognitive domains of Bloom's taxonomy, which divides learning objectives into different levels of cognitive complexity.

TIMSS assessments play a crucial role in assessing and comparing student achievement in mathematics and science across countries. It provides valuable insights into the effectiveness of educational systems and helps identify areas for improvement. TIMSS aims to promote excellence in mathematics and science education worldwide by assessing students' knowledge and skills in these subjects [9].

TIMSS consists of two mathematics assessment frameworks:

- TIMSS mathematics fourth grade;

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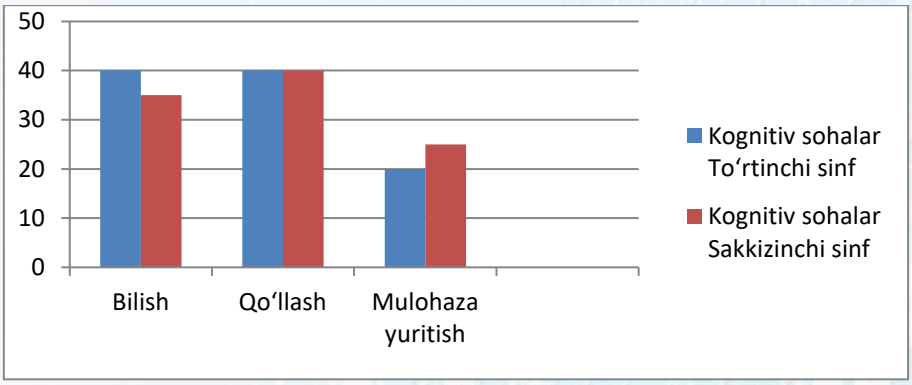
- TIMSS mathematics eighth grade.

The TIMSS-2023 mathematics assessment system is organized in two directions:

- Content area intended for assessment of science-related areas;

-Cognitive field designed to evaluate thinking processes [10].

The target percentages for the TIMSS math assessment for cognitive domains in grades four and eight are:



Results

Based on the above criteria, we have given examples of tasks corresponding to the international research criteria for checking the literacy of schoolchildren in mathematics and natural sciences [10].

Mathematical Literacy: Samples of test items for assessing mathematical literacy of 4^{th}-8^{th} grade students in TIMSS International Assessment Studies:

1-topshiriq. Identify each number that is a divisor of 15?

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Answer:_____

Content Area: Numbers and Operations

Cognitive domain: Knowing; know or give examples of processes

Maximum score: 2

Key: 1, 3, 5, 15

Task 2. Find the redundant form in the row.

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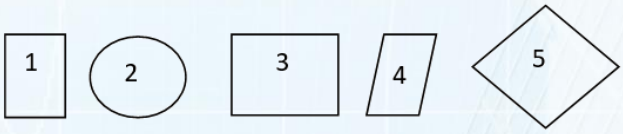

A) 1 B) 2 C) 3

Content Area: Geometry; depicting shapes on a plane

Cognitive domain: Reasoning; implementation of knowledge, application and reasoning at different levels when demonstrating mathematical competence [11].

Maximum score: 1

Key: B

3-topshiriq. $\frac{}{3} > \frac{6}{4}$ What number should be written in the empty cell so that the inequality is true.

A) 6 B) 4 C)5 D) 2

Content Area: Numbers and operations; simple and decimal fractions

Cognitive Domain: Knowing

Maximum score: 1

Key: A

Task 4. The playground of the school is rectangular. The length of the sides of the site is 100 meters. Botir went around the entire site. How far did he walk?

A) 100 metr B) 200 metr C) 400 metr D) 10000 metr

Content Area: Numbers and operations; mathematical operations

Cognitive domain: Reasoning; implementation of knowledge, application and reasoning at different levels when demonstrating mathematical competence [12].

Maximum score: 1

Key: D

Task 5. Paint is sold in 5-liter cans. Mahmoud needs 35 liters of paint. How many cans should he buy?

A) 5 B)6 C)7 D)8

Content Area: Algebra; natural numbers

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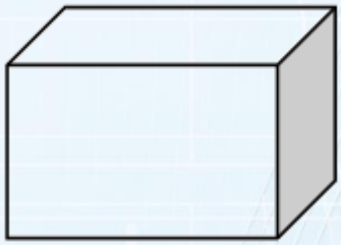
Cognitive field: Application

Maximum score: 1

Key: C

Task 6. What are all the angles of the cube in the drawing?



Content Area: Geometry; geometric measurements

Cognitive domain: Knowing; know examples of processes

Maximum score: 1

Key: 2160 pcs

Task 7: If x=73, what is the value of the expression y=$\sqrt{x-9}$?

A) 3 B)5 C)8 D)36

Content Area: Algebra; Equations, expressions, functions

Cognitive domain: Knowing; knowing or giving examples of processes [13].

Maximum score: 1

Key: C

Task 8: What number should be substituted for the equality to be correct?

6• =36

Answer:_____

Content Area: Numbers and operations; numerical expressions and equations

Cognitive field: Application

Maximum score: 1

Key: 6

Task 9. Two people were playing chess. Each of them won 5 times. How is this possible?

Content Area: Numbers and operations; Mathematical operations

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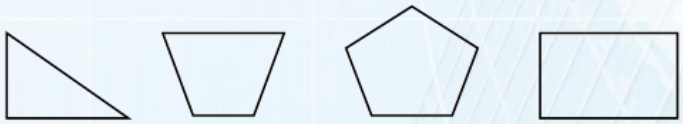
Cognitive field: Application

Maximum score: 1

Key: They were playing with other people

Task 10. Name all the shapes in the picture with one word.



A) rectangles B) polygons C) triangles

Literacy of natural sciences: Samples of tasks for assessing the literacy of 7-8th grade students in TIMSS International Assessment Studies:

Task 1. Complete the table below to show the number of atoms of each element in a molecule of medium phosphoric acid ($HMnO_4$):

Element	Number of atoms
Hydrogen	
Manganese	
Oxygen	

Task 2. Why can you see more stars in rural areas than in big cities?

a. In the city, the moon casts a brighter light, blocking out the light of many stars.

b. Dust particles that reflect light are more abundant in rural air than in urban air.

c. Bright city lights don't allow you to see many stars.

d. Urban air becomes warmer due to the heat emitted from vehicles and houses [14].

Task 3. Match the organic acids in the products given below

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a. CH_3-CH(OH)-COOH

b. HOOC-CH_2-CH(OH)-COOH

c. HOOC-CH_2-C(OH)(COOH)-CH2-COOH

d. CH3-$(CO)_2$-COOH

A) 1-a; 2-b; 3-c; 4-d B) 1-b; 2-d; 3-a; 4-c

C) 1-b; 2-d; 3-a; 4-c D) 1-d; 2-c; 3-b; 4-a

Task 3. Which substance conducts heat well?

A) wood B) metal C) glass D) plastic

Task 4. Why are many electrical wires made of metal?

Explain your answer.

Task 5. Which plant does not release oxygen?

A) Greek B) funaria C) zarpechak D) porphyria

Task 6. Ahmed put some powder in the test tube. Then he poured liquid into the powder and shook the test tube. A reaction has occurred. Describe two phenomena that he might observe [15].

Answer:

1._____

2._____

Task 7. Determine the total number of nerve cells in the brain?

A) 14-16 billion

B) 13 mln

C) 1.1 trillion

D) 100 billion

Task 8. During the metamorphosis of a dog, under the influence of the thyroxine hormone of the thyroid gland, the tail and side line organs disappear in the dog. For which structural level of life is this phenomenon relevant?

A) organism

B) population

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C) cell

D) biogeocenosis

Task 9. Determine the values of A using the data given in the table below [16].

Compound	Number of hydrogen atoms	Total number of atoms	C-C bog'i	C-H bog'i
C_nH_{2n+2}	A	15	B	D
C_nH_{2n-6}	A	20	C	E

aimed at [18]. To do this, conduct experimental tests on the basis of assignments developed in accordance with the requirements of international studies, assignment 10 to educational processes. Below are the results of the long jump competition:

Average long jump:

A team 3.2 m

B team 4.6 m

The number of students in each team is equal.

Which statement about competition must be true?

A) Team B jumped further than team A.

B) Every student in team B jumped farther than every student in team A.

C) After each student from team A who jumped, there was a student from team B who jumped further.

D) Some students of team A jumped further than some students of team B.

Discussion

It should be recognized that the TIMSS assessment plays an important role in determining and comparing the achievement of students in mathematics and science in different countries [17]. It provides valuable insights into the effectiveness of educational systems and helps identify areas for improvement

[21]. TIMSS progressively integrates the worldwide promotion of excellence in mathematics and science education by assessing students' knowledge and skills in these subjects to develop specific knowledge and skills in students. is important [19]. This is the most correct way to increase the rating of the development of our country and help students to live without difficulties in the future [20].

Conclusion

In conclusion, the assessment criteria used to assess students' performance in mathematics and science in TIMSS tasks are consistent with Bloom's taxonomy. These criteria assess students' factual knowledge, conceptual knowledge, procedural knowledge, and metacognitive knowledge [20]. TIMSS scores provide valuable insights into student achievement in math and science and help identify areas for improvement in education systems around the world [21].

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