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RESEARCH ARTICLE

Ways to Use Timss International Assessment Programs to Building Students' Scientific Literacy in Geography Lessons

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Abstract

This article describes the types of international studies on the assessment of the quality and results of education, the work being carried out to organize international studies in the field of assessing the quality of education in the public education system of our Republic, PISA, TIMSS studies and their significance in the formation of students' natural and scientific literacy in geography lessons. The article also presents examples of TIMSS tasks on knowledge, application, and reasoning used in geography lessons.

KEYWORDS

Geography, student, TIMSS, educational quality assessment, international assessment studies, scientific literacy, knowledge, application, reasoning.

INTRODUCTION

The development of the educational system in our country has risen to the level of State Policy, large-scale work is being carried out to raise the educational and educational system to a completely new level, to radically improve the quality level of pedagogical personnel training processes in accordance with generally accepted international requirements and standards.

On December 12, 2018, Resolution No. 997 of the Cabinet of Ministers of the Republic of Uzbekistan "on measures to organize international research in the field of assessing the quality of education in the public education system, to establish international relations, to comprehensively support and encourage the research and innovative activities of students and young people, and above all, creative ideas and creativity of the younger generation".

In the international study "concept of development of the public education system of the Republic of Uzbekistan until 2030", approved by the decree of the president of the Republic of Uzbekistan No. 29.04.2019 PF-5712, it is determined to ensure the participation of Uzbekistan and achieve access to the top 30 by 2030 [1, 12].

International comparative studies on quality assessment of Education: conducted by the organization for Economic Cooperation and Development (OECD) and the international Accociation for assessment of educational outcomes (HTA) - (IEA–International Association for the Evaluation of Educational Achievement) organizations [9].

Educational achievement assessment: conducted by TIMSS, PIRLS, ICCS and the International Association for ICILS research.

Today, Education Quality Assessment includes PISA (Programme for International Student Assessment), TIMSS (Trends in Mathematics and Science Study), PIRLS (Progress

in International Reading Literacy Study), EGRA (the Early Grade Reading Assessment), EGMA(the Early Grade Mathematical Assessment), TEDS (The Teacher Education and Development Study in Mathematics), ICCS (international Civic and Citizenship education Study, ICILS (International Computer And Citizenship education Information Literacy Study), PIAAC (programme for the international assessment of adult competencies, There are many international research studies available, such as TALIS (Teaching and Learning International Survey) and AHELO (Assessment of Higher Education Learning Outcomes).

In our republic, the assessment of the quality of general secondary education is mainly used - programs of international studies such as PISA, TIMSS and PIRLS. The concurrence of these three studies creates conditions for the assessment of different aspects of the educational system. Among these international studies, the TIMSS assessment programs are of particular importance in the formation of students' natural-scientific literacy in geography education. [8].

TIMSS is an international monitoring study of the quality of mathematics and science education (Trends in Mathematics and Science Study) conducted by the International Association for the Evaluation of Educational Achievement (IEA). This study, conducted every four years, assesses the preparedness of 4th and 8th graders in mathematics and natural sciences, as well as 11th graders in schools where mathematics and physics are taught in depth. Four-year study cycles allow fourth graders to compare the results achieved when they are eighth graders, as well as to make changes in students ' math and natural science training during the transition from beginner to basic [3].

One of the main strategic goals of the modern education system is to develop in students not only fundamental knowledge, but also the ability to apply them in life, that is, literacy. In particular, in geography lessons, the concept of natural-scientific literacy (Scientific Literacy) refers to the student's ability to understand the world on a scientific basis, analyze changes in nature and understand the impact of human activity on the environment [6].

According to the requirements of the international TIMSS assessment program, natural literacy in geography education includes three main areas:

1. Describing scientific phenomena: The student should be able to explain natural processes (e.g., volcanic eruptions, earthquakes, climate change, river changes) using scientific terminology.

2. Design and evaluation of scientific research: the ability to develop hypotheses and make observations by collecting geographical data (climate indicators, water regime of rivers, population dynamics, statistics on age, gender, race, religion and other composition of the population).

3. Scientific interpretation of data and evidence: Ability to read and draw logical conclusions from data presented in maps, diagrams, graphs, and tables.

Geography is unique in its ability to enhance natural-scientific literacy in students. This subject is located at the intersection of natural and social sciences and serves as a bridge in the formation of natural-scientific literacy. When a student understands how an increase in atmospheric humidity (a physical process) affects the plant world (a biological process) and, as a result, human agriculture (an economic process), a holistic scientific worldview is formed [5,12].

In addition, in the current global environmental crises, global climate change, water scarcity, and depletion of natural resources, the formation of natural science literacy in students is a vital necessity. This will certainly provide an opportunity to widely use cognitively structured tasks based on international assessment studies, in particular TIMSS, in geography lessons. When completing these tasks, students complete tasks that describe mental processes in areas such as knowledge, application, and reasoning.

Test items in this area assess students' knowledge of facts, relationships, processes, concepts, and equipment. Accurate and comprehensive knowledge based on facts allows students to successfully carry out more complex cognitive activities necessary for scientific activities. Compared to the traditional approach to lessons, lessons organized based on TIMSS requirements have a number of advantages. We can clearly see the difference between them in the table below (table 1).

1- table

The difference between lessons organized based on TIMSS requirements and the approach to traditional lessons

Criteria	Traditional geography education	Geography in the TIMSS format
Main goal	Memorizing facts and knowing terms.	Applying knowledge in real-life situations.
Question type	Closed tests, "What?", "When?".	Open-ended questions, "Why?", "How?".
Working with a map	Show and name objects.	Analyzing patterns using maps.
Student role	Listener and information receiver.	Seeker, analyst and researcher.
Result	High level of theoretical knowledge.	The level of natural-scientific literacy is high.

According to the requirements of the international TIMSS assessment program, assignments in the field of Earth Sciences (Earth Science) should account for a 20% to 25% share in the structure of the Natural Sciences (Science) Block. Below are examples of TIMSS tasks for knowledge, application, and reasoning that are used in geography lessons:

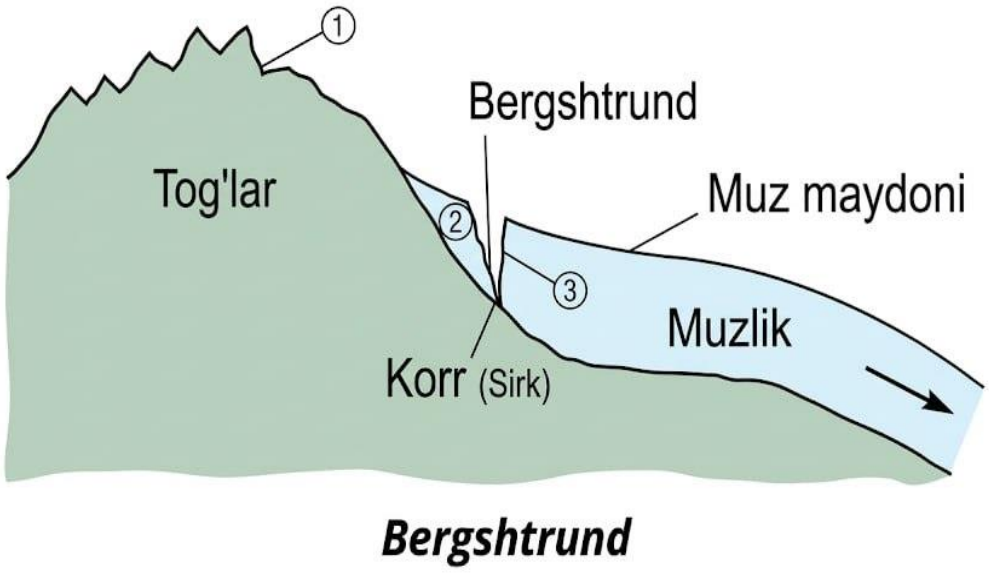
1.1. Knowledge. What is the process (downward movement) indicated by the direction indicator (arrow) in Figure 1?

A) evaporation of water into the atmosphere

B) the downward movement of the glacier

C) Uplift of mountains

D) Wind erosion



1- image. The work of ice

1.2. Application. What is depicted in Figure 1 with the number ②?

Write the answer:

_____

_____

_____

1.3. Organize a discussion. A bergschrund is a deep crevasse that forms at the top of a glacier, near the mountain. Based on Figure 1 given above, why is it exactly in this place (Carr or circus is a huge saddle-shaped (creslosimon) bog, which is

formed in the upper part of the mountain, under the influence of glaciers.) appeared. Explain?

Write a logical explanation:_____
_____
_____
_____
_____

The correct answer is: Because moving ice ② separates from stationary ice ① in the mountain. This process occurs due to the steep slope of the mountain slope and gravity.

2.1. Knowledge. Analyze the relief forms and their names depicted in Figure 2. What is the name of the Karr, a chair-shaped depression and the small lake within it, that formed in the place of the glacier after it melted?

A) Suspension valley and waterfall

B) Corr (cirque) and corr lake

C) Pyramidal peak and moraine

D) U-shaped valley and ribbon lake

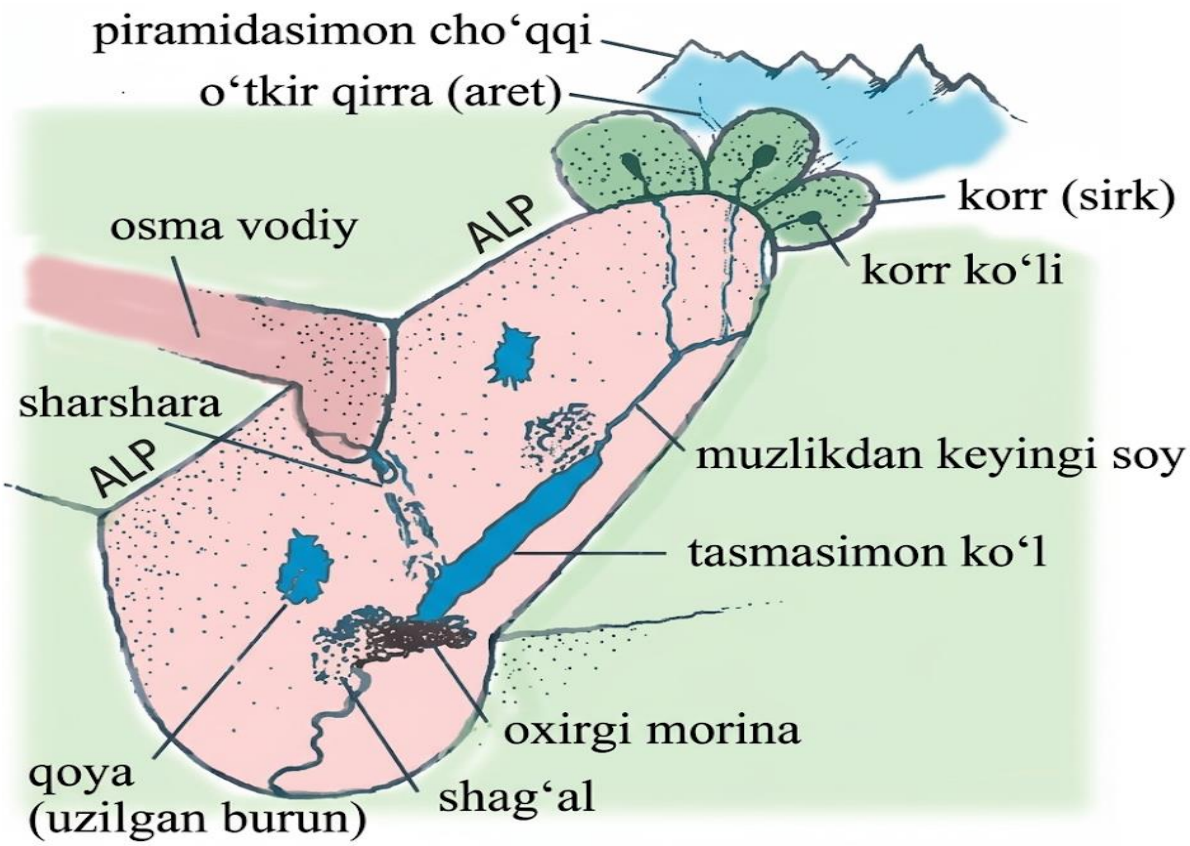


Figure 2. U-shaped valley

2.2. Application. Figure 2 shows a "U-shaped valley" that is not typical of river valleys. Explain how glaciers can expand a simple River Valley (v-shaped) to form a “U”.

Direction for the answer: take into account the mass of the glacier and the impact of moving stones on the side walls with it.

The correct answer is: A glacier has a huge mass and, as it moves downhill, it carries solid rock and gravel with it. These materials act as "piling" (glacial plowing), widening the valley by plowing both the bottom and the side walls. The result is a U-shaped valley with steep walls and a wide bottom.

2.3. Organize a discussion. How can the "Last Moraine" (terminal moraine) and "Gravel" piles, shown in the lower part of Figure 2, provide information to scientists about climate change? Question: How to draw conclusions about the past climate of this area if scientists find ancient Moraine heaps far from the foothills, where the current glaciers cannot reach?

Correct answer (Sample): This indicates that in the past, the climate in this area was much colder than it is now, and glaciers extended much further down (to the base). The

moraine pile acts as a "border" that marks the farthest point reached by the glacier.

As the examples above show, TIMSS tasks require students to demonstrate not only the ability to memorize theoretical knowledge, but also the ability to apply it in real-life situations. The use of TIMSS assignments in geography classes serves as an important tool in students to analyze life situations, bring complex geographical processes (such as the importance of longshore drift or transit corridors) to the fore, and to formulate skills for logical thinking and their use in the necessary life circumstances. Also, the constant use of practical assignments in the TIMSS format brings School Education closer to international standards. Students will not only have access to theoretical information, but will also be raised to the level of generalization, analysis and prediction of the knowledge gained. We believe that this methodological guide will provide practical assistance to teachers in organizing lessons in a more interesting and high-quality way, and in preparing students for 21st century skills. In the future, it is recommended to systematize tasks in this format across all subjects and enrich them with digital resources.

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