

Pisa Program for Reading and Science Literacy Improvement in Biology Studies

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Summary: Along with the globalization and internationalization of higher education, the problems of a generalized assessment of its quality are becoming more urgent. A knowledge-based society requires a large number of specialists who are able to independently make competent and responsible decisions. The traditional methods of assessing the quality of education, which are limited mainly to testing the knowledge and skills provided by the school curriculum, should be replaced by new methods based on assessing competence. In this context, the results of the international study of the achievements of schoolchildren PISA (Program for International Student Assessment) seem to be extremely important, the significance of which experts see precisely in an attempt to determine the level of competence formation.

Keywords: PISA program, quality of education, mastery of biological programs, assessment of student skills, natural science literacy, quality of reading and text comprehension

In December 2018, the Ministry of Public Education of Uzbekistan and the State Inspectorate for Supervision of the Quality of Education adopted a joint order "On the approval of criteria for assessing the effectiveness of the activities of educational institutions." Uzbekistan decided to take part in the PISA program from 2021, which will allow to objectively assess the level of education development in the country and make decisions to eliminate deficiencies. Elements of the PISA program will also be actively used in the compilation of the national rating of schools and universities in Uzbekistan. It was noted that responsible leaders should begin work on preparing Uzbekistan's participation in the PISA program. Appropriate instructions were given for the effective organization of work in this direction.

According to the PISA 2015 student well-being analysis framework (Borgonovi and Pál, 2016), the survey identifies five dimensions of well-being:

Cognitive Well-Being: The cognitive aspect of student well-being refers to the skills and foundations that students need to participate actively in society as lifelong learners, effective workers, and engaged citizens. It is about the level of knowledge of students in various school subjects, their ability to collaborate with others to solve problems and their sense of mastery of different subjects. In the PISA 2015 study, this parameter is assessed, on the one hand, as the level

of knowledge acquired by students in a specific subject, which is measured by survey tests, and on the other hand, as the degree of students' confidence in these subjects, as measured using questionnaires.

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In the PISA-D study, this dimension is assessed on tests and included in the module on school performance as a result of prosperity.

Psychological Well-being: The psychological aspect of student well-being refers to how students perceive their life, their commitment to school, and their goals and ambitions. In PISA 2015, this dimension describes the psychological functioning reported by students and includes individual satisfaction (overall student satisfaction with life in general) and three related aspects of psychological functioning of education: 1) identifying goals and emotions associated with students. "Academic and professional aspirations; 2) motivation for success associated with students' assessment of the learning opportunities offered to them, their commitment to learning and the desire to acquire knowledge; and 3) anxiety related to school performance and grades.

As in the PISA study, the PISA-D questionnaires for pupils and out-of-school youth measure the general satisfaction of young people with their lives. The program also offers an assessment of emotional distress (severe anxiety and depression) and asks questions about respondents' physical and mental health over the past year in the health and wellness module. In terms of education-related elements, the PISA-D survey analyzes educational attainment in more detail than the PISA survey by asking out-of-school students and young people about long absenteeism and why. It also offers a deeper insight into the experiences of out-of-school youth by asking them questions about their professional status, profession, work hours per week and their wages. The out-of-school youth component of the survey also collects information on young people's participation in

reading and writing, such as how often they read a newspaper, magazine or book, how often they read a newspaper, magazine or book, how often they write text, email, etc.

The definition of reading and writing literacy has changed over time along with social, economic and cultural changes. The concept of learning, and especially the concept of lifelong learning, has expanded the concept of reading comprehension. Reading comprehension is no longer seen as a skill that can only be learned in childhood and early school years. It is currently defined as a dynamic set of knowledge, skills and strategies that people develop throughout their lives in the various situations presented to them through interactions with their peers and the community at large.

Cognitive science-based reading comprehension concepts emphasize the constructive nature of text comprehension, the variety of cognitive processes associated with reading, and their interactive nature. When faced with a text, the reader constructs meaning using his prior knowledge and a series of clues related to the text and the situation, which often have social or cultural value. To construct meaning, the competent reader uses a variety of processes, skills, and strategies that enable them to find information, control and maintain understanding (van den Broek et al., 2002), and critically assess the relevance and reliability of information (Richter and Rapp, 2014). It can be expected that these processes and strategies will differ depending on the context and the goals that readers pursue when interacting with different types of continuous and discontinuous texts in print and electronic media.

In the proposed article, our attention is paid to the formation and development of metasubject skills, the development and inclusion in the educational process of test tasks of various forms and levels of difficulty, aimed at working with educational texts. In the methodology of teaching biology of the previous decades, quite a lot of experience has been accumulated in using work with textbooks, as well as with other sources of additional information on biology, taken from books, magazines and newspapers. Teachers and students shared their knowledge, new information in biology lessons, involving students in the discussion of previously unknown material. Particular importance was given to the use of books on biology in extracurricular activities when setting up experiments and observing biological objects.

An analysis of the work experience of innovative teachers of biologists in the 50s – 90s of the last century allows us to talk about the use of additional literature of different genres (popular science, science fiction, fiction) in all types of extracurricular work (individual and group). Working with books and texts was in demand not only in the preparation and conduct of extra-curricular activities: exhibitions, holidays and companies, youth circles, but also in various forms of school

activities: excursions to nature, zoos, museums, botanical gardens. The issues of using additional literature of biological content were devoted to dissertations, scientific articles, methodological manuals.

When students succeed at a certain stage of development, their course may be affected if they are targeted at certain classes, directions, or institutions. Students with good reading and language skills, for example, are more likely to be directed to classes or paths where they will benefit from positive interactions with their peers, better learning, quality, and other factors that will enable them to develop their skills at a faster pace. On the other hand, children who have learning difficulties at some stage are more likely to be sent to classes with a lower level of ability and, therefore, have less access to factors that contribute to the development of their skills.

The majority of students stated that they value science highly: 93% of students believe that science is important for understanding the natural world, and 92% believe that advances in science and technology improve the living conditions of people. But a significant number of students distinguish the contribution of science to enhancing productivity and technical understanding from its overall contribution to society and the economy. This is the case in several OECD countries, where the majority of students disagree that advances in science and technology lead to social progress: 40% in Iceland, from 32% to 39% in France, Great Britain, Switzerland, Belgium, in New Zealand.

The fact that students come from immigrants seems to influence the importance they attach to science. In eighteen of the thirty-three participating countries, at least 3% of students with an immigrant background in the PISA sample, the overall science score is the same among indigenous and immigrant students. In ten other countries, it is higher among students of immigrant background: the gap between the two groups is especially noticeable in New Zealand, the United Kingdom, Canada and Australia. The opposite is true for five countries, especially Estonia and Slovenia. PISA seeks to measure the degree to which students perceive themselves to be able to complete assignments and overcome difficulties (the Perception of Personal Scientific Ability Index) and to assess their perception of their academic skills in science (the Index of Perception of Self in Science).

In the new information environment, the book has lost its high value, computer technologies have come out on top: games, being in virtual reality. Students gain information about experiments and experiments in biology mainly from the Internet. The majority of schoolchildren do not have a developed need for reading. They "drown" in the stream of unnecessary and sometimes incomprehensible information, they cannot realize the factual material that has fallen on them, and

they cannot distinguish the main information from the secondary ones.

In the new educational environment, it is necessary to use various sources of information, but along with them, one should not neglect the traditional means of teaching on paper (textbooks and other educational books). Working with texts today takes on a slightly different meaning.

The compilation and use of biological texts or integrated articles, including information from different subject areas, and tasks for them will make it possible to comprehend natural phenomena in general, apply knowledge from different areas of natural sciences. Today, the student is required to master the methods and techniques of independent work, a set of skills for conducting research and project activities, flexibility in acquiring new knowledge and mastering new types of activity. A modern graduate must be socially adaptive, be able to apply theoretical knowledge in practice, quickly rebuild to acquire new knowledge and skills.

The basis of natural science literacy is the ability to use natural science knowledge to isolate problems in real situations and solve them using scientific methods. This ability is competence. "Competence is the ability of a student to use cognitive skills to solve interdisciplinary real-life problems in which the way of solving at first glance is not clearly defined. The skills needed to solve the problem are formed in different educational areas, and not just within one of them. "To assess this ability, students are offered problems that differ from traditional school assignments and are characteristic of real life situations. These situations, as a rule, are new for students, are connected with their personal life, work, rest, with the life of society. The problems posed within the framework of these situations require the student, relying on the already existing skills and knowledge gained in the study of various academic subjects, to apply their abilities in a new context, to develop approaches to solving problems, to show flexibility of thinking. The competence of students in the field of problem solving is interdisciplinary, in real life it serves as the basis for further learning, for effective participation in the life of society, for organizing their personal activities, and can be attributed to "real life" competencies. To assess the competence of students in the study, tasks were used in which it was proposed to solve one of three types of problems related to important aspects of daily life and often encountered in real life situations.

In problems of the "decision making" type, students are required to understand the possible solutions and constraints formulated in the condition, and make a decision that meets these constraints. In problems such as "analysis and planning" the student must analyze the situation and plan a system that meets the requirements formulated in the condition. In problems such as "sudden problems", students are required to understand the operation of the device, identify the

features of the problem, diagnose the problem, and propose a solution to the problem.

To solve the proposed problems, it is necessary to master certain general educational skills. Each of these general skills includes a set of more specific ones. Below is a description of the highlighted general educational skills:

- “understand the problem” - use the existing knowledge and skills to understand information presented in the form of text, diagram, formula or table, and extract the necessary information from them: integrate information from different sources.
- “characterize the problem” - identify the variables present in the problem and the relationships between them; decide which variables are related to the problem and which are not; build hypotheses; highlight, organize and critically evaluate the information provided in the condition.
- “present a problem” - develop a form of presentation of information in the form of a table, graph, using symbols or in verbal form, or apply the form proposed in the statement to solve a problem; move from one form of information presentation to another.
- "solve the problem" - make decisions in accordance with the terms of the problem; analyze the proposed system and plan it to achieve the goals formulated in the problem; determine the cause of the failure in the device and suggest a way to eliminate it.
- “reflect on the solution” - to investigate the received solution and, if necessary, seek additional information to clarify it; evaluate the resulting solution from different points of view to create a socially or technologically acceptable solution; explain the resulting solution.
- “communicate the solution to the problem” - choose the form of presentation of the result obtained and present it clearly for other people.

Applying these skills requires the learner to be proficient in reasoning skills. For example, to understand a situation, the student must distinguish between facts and opinions. When choosing a strategy for solving a problem, he must consider cause and effect. The student should logically state his solution, if provided in the assignment. All this requires the use of the skills of analytical reasoning, reasoning by analogy, combinatorial reasoning. It is the reasoning skills that underlie the ability to solve problems and form the core of competence in this area.

“Semantic reading” is gaining more and more importance, its main task is the ability to search, transform and interpret (understand), evaluate and use the information read. The formation of "semantic reading" aimed at achieving the value-semantic content of the text, meta-subject and

personal results by the reading student, is given attention in scientific articles devoted to teaching biology.

A special place in the concept of functional literacy is occupied by activity literacy, or the ability to set and change the goals and objectives of one's own activity, to carry out communication, to implement the simplest acts of activity in a situation of uncertainty, using natural science literacy. So, the concept of natural science literacy, which means not only students' possession of traditional skills, knowledge and skills, but also in life you need to be able to use the knowledge gained in practice: read instructions and labels on the use of various chemicals, washing powders, cleaning products in everyday life, preparation of solutions in canning, salting, etc., read the instructions for the use of drugs, etc.

According to this concept of functional literacy, its diagnostics includes:

1. The process of mastering literacy, that is, the development of chemical and biological languages, and without which it is impossible to obtain information and use knowledge in a particular area of life and activity.
2. The learning process, that is, the development of knowledge, abilities, skills in the subject and academic disciplines.
3. The process of preparation, that is, the adaptation of existing and acquired knowledge, skills and abilities to carry out practical, laboratory work, the use of an algorithm in solving problems or for occupying a certain social position.
4. The process of education, that is, the development of the rules and norms of culture, traditions and characteristics of the people, social status.
5. The process of education, in the narrow sense of this term, that is, an integral part of the integral process of education, with the aim of providing a general level of culture and familiarity with the values, attitudes and standards of civilization.

In the process of working with texts, communicative competencies are formed. They include not only expanding their knowledge and capabilities based on the ability to work with the educational text, but also the ability to focus on each other and correlate their actions with other team members, make joint plans, be able to understand and empathize with a partner, and participate in social life. Working with texts of biological content and test tasks for them are also used to form natural science literacy. It implies the ability of a person to take an active civic position on the natural sciences, interest in them, and participation in discussions on these issues. A person with natural science literacy discusses and argues the problems of natural science discoveries and technologies, which require from him scientific explanations of phenomena, the assessment and

planning of scientific research, the interpretation of data, the formulation of evidence and conclusions. In addition to the above, natural science literacy presupposes the development of basic knowledge necessary for the study of physics, chemistry, biology, geography; the formation of general educational skills, understanding the influence of science (physics, chemistry, biology, geography) and technology on the development of society; the formation of a natural science worldview.

The formation of reading and natural science literacy involves the use of texts of various natural science content: about the achievements of the natural sciences, from the history of the development of science, acquaintance and interpretation of historical facts of a biological nature, socially significant events for students and their environment, texts of a problematic nature, etc.

The discussion of the content of the texts can be carried out in the form of a discussion. The teacher in the lesson invites students to read the text and discuss the assignments to the text (1–8). Depending on the didactic goals of the lesson, assignments can be educational, diagnostic or controlling in nature (example):

Break the text into semantic parts and give a title to each of them.

“The skeleton of vertebrates is formed by bones, tendons and ligaments. Bones are very strong. So, the tibia of a person can withstand a load of 1250 kg. Bones are composed of organic and inorganic substances, this combination makes the bone strong and sufficiently elastic. The bones are connected in the skeleton motionlessly, with the help of sutures (for example, in the skull), and movably - by joints. Ligaments are special formations consisting of connective tissue that connect bones to each other at joints - joints. Tendons are also formed by connective tissue; they attach muscles to bones. ”

Using the same text, you can invite students to find the basic concepts of the topic in it. This technique will help in solving the main problems - the formation of knowledge and the development of natural science literacy of students. You can also invite students to find additional material to this text on the topic in popular literature, encyclopedia, reference book.

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