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**Malahat Abdullayeva**  
Azerbaijan State Pedagogical University  
Doctor of Philosophy in Pedagogy  
azeriteacher@yahoo.com  
<https://orcid.org/0000-0002-2228-1224>

## Organization Methodology of Diagnostic Assessment in Mathematics Lessons

### Abstract

In-school assessment in secondary schools is carried out using diagnostic, formative, and summative assessment types.

The article talks about the diagnostic type of in-school evaluation, the methods and tools used, and the technology of their organization. Diagnostic assessment is a preliminary assessment that allows the teacher to determine the strengths and weaknesses of students, and the current state of their knowledge and skills. This evaluation is carried out at the beginning of the school year, the first and second semesters, at the beginning of each educational unit, when the student moves from school to school, from class to class, and in other necessary cases. This assessment conducted by the teacher aims to collect information about the student's knowledge and skills and determine the learning strategy. The results of the diagnostic assessment are not recorded in the school journal.

The article will play a major role in developing the diagnostic assessment skills of mathematics teachers and increasing their professionalism.

**Keywords:** *mathematics, in-school assessment, diagnostic assessment, methods, means*

**Mələhət Abdullayeva**  
Azərbaycan Dövlət Pedaqoji Universiteti  
pedaqogika üzrə fəlsəfə doktoru  
azeriteacher@yahoo.com  
<https://orcid.org/0000-0002-2228-1224>

## Riyaziyyat dərslərində diaqnostik qiymətləndirmənin təşkili metodikası

### Xülasə

Ümumtəhsil məktəblərində məktəbdaxili qiymətləndirmə diaqnostik, formativ və summativ qiymətləndirmə növlərindən istifadə etməklə həyata keçirilir.

Məqalədə məktəbdaxili qiymətləndirmənin diaqnostik növündən, istifadə olunan üsul və vasitələrdən, onların təşkili texnologiyasından bəhs edilir. Diaqnostik qiymətləndirmə müəllimə şagirdlərin güclü və zəif tərəflərini, onların bilik və bacarıqlarının mövcud vəziyyətini müəyyən etməyə imkan verən ilkin qiymətləndirmədir. Bu qiymətləndirmə dərslərin əvvəlində, birinci və ikinci semestrə, hər bir tədris bölməsinin əvvəlində, şagird məktəbdən məktəbə, sinifdən sinfə keçərkən və digər zəruri hallarda aparılır. Müəllim tərəfindən aparılan bu qiymətləndirmə şagirdin bilik və bacarıqları haqqında məlumat toplamaq və təlim strategiyasını müəyyən etmək məqsədi daşıyır. Diaqnostik qiymətləndirmənin nəticələri məktəb jurnalında qeyd edilmir.

Məqalə riyaziyyat müəllimlərinin diaqnostik qiymətləndirmə bacarıqlarının inkişaf etdirilməsində və peşəkarlığının artırılmasında böyük rol oynayacaqdır.

**Açar sözlər:** *riyaziyyat, məktəbdaxili qiymətləndirmə, diaqnostik qiymətləndirmə, metodlar, vasitələr*

### Introduction

The "Educational Reform Program of the Republic of Azerbaijan" (Educational Reform Program of the Republic of Azerbaijan, 1999), approved by the decree of the President of the

Republic of Azerbaijan on June 15, 1999, changed the approach to the training process in all educational institutions, especially in general schools. The main goal of the reform is the formation of the student as a personality based on the principles of democratization, humanization, integration, differentiation, individualization, and humanitarianization. Therefore, the school should make way for each student to feel himself as an individual.

In order to implement the requirements of the reform program, documents were prepared and decisions were made. One of these documents is the "Evaluation Concept in the General Education System of the Republic of Azerbaijan" approved on January 13, 2009. The Evaluation Concept played a major role in determining the quality of education, improving the teaching and learning process, and solving the problems of evaluating educational achievements.

### **Research**

The Law of the Republic of Azerbaijan on Education (Law of the Republic of Azerbaijan on Education, 2010) states that the educational program (curriculum) includes the curriculum, teaching programs for subjects, recommendations on methodical provision, assessment and other relevant educational technologies. At the same time, the main goal of education is "...to prepare specialists-personnel who protect and develop national-moral and universal values, who have a broad outlook, who are able to evaluate initiatives and innovations, who acquire theoretical and practical knowledge, who have a modern mindset and who are competitive..." (Law of the Republic of Azerbaijan on Education, 2010) is brought to the attention of teachers. Therefore, conducting an assessment in the training process is a requirement for teachers.

Assessment of student achievements in general education schools of our country is carried out in accordance with the requirements of the "Evaluation Concept in the General Education System of the Republic of Azerbaijan" (Evaluation Concept in the General Education System of the Republic of Azerbaijan, 2009). It is important to monitor the progress, development, and quality of education, to guide it in a timely and correct way, and to evaluate the daily activities and achievements of students.

In the Evaluation Concept in the general education system of the Republic of Azerbaijan, it is noted that evaluation is carried out in three directions: international, national, and intra-school evaluation (Evaluation Concept in the General Education System of the Republic of Azerbaijan, 2009). Here, the main principles, goals, and components of the evaluation directions are presented, the application mechanisms are presented, the necessary activities are described, and at the same time, the forecasts of the expected results are also mentioned.

### **In-school Assessment**

In-school assessment monitors state education standards, measures knowledge, and skills based on content standards, and assesses learning achievement. In-school assessment is carried out in the following areas:

1. Assessment of student achievement. It is carried out by teachers and school leaders at the school level. At this stage, students' achievements are evaluated in formative (regular, continuous), micro summative (by debates and sections), and macro summative (by semesters) written and verbal forms.

2. Curriculum assessment. It is conducted in order to determine the compliance of the student's training results with the relevant content standards.

3. The final evaluation of the general educational levels is carried out in the form of final examinations conducted in a centralized manner and ends with the issuance of a relevant educational document.

In-school assessment is carried out using diagnostic, formative, and summative assessments (Jabrayilov & Ibadova, 2023).

### **Diagnostic Assessment**

Diagnostic assessment is a preliminary assessment that allows the teacher to determine the strengths and weaknesses of students, and the current state of their knowledge and skills. This type of assessment serves as a barometer for the teacher, allowing for effective lesson planning and effective instructional design. It is appropriate to conduct a diagnostic assessment in the following

cases (Educational program (curriculum) in mathematics for secondary schools of the Republic of Azerbaijan, 2013):

- At the beginning of the new academic year or the first semester and the second semester;
- At the beginning of each section or teaching unit provided in the teaching resources;
- When the student moves from school to school, class to class.

The purpose of the diagnostic assessment is to determine the issues of knowledge, skills and misconceptions of the students before planning the training and to organize effective training. This type of assessment allows for individualization of teaching (differential training) and at the same time to get information about students' interests, outlook, and living environment (Ismayilova & Huseynova, 2021).

In mathematics classes, diagnostic assessment uses various methods – conversation with the student, oral and written inquiry, open and closed answer questions, theoretical and practical assignments, written work, cooperation with the student's parent or subject teachers, etc. methods are used. It is appropriate to use assignment and observation methods for more accurate determination of diagnostic knowledge and skills in mathematics. Corresponding written records (a brief description of the results) related to the results of the diagnostic evaluation are kept in the personal folders of students – portfolios.

Conducting diagnostic assessments in mathematics classes greatly supports teachers in correctly defining the teaching strategy and in providing an individual approach to students. By conducting the diagnostic assessment effectively, the teacher can clarify what the students already know about the subject and what needs to be learned (Kahramanova, Karimov, & Huseynov, 2019).

For this, it is enough to find answers to the following questions:

- What do students already know?
- What do students not know?
- At what level does the student compare to other students in terms of learning achievement?
- How to improve student learning achievement?

In mathematics classes, diagnostic assessment is carried out in an inconspicuous way at the beginning of each new lesson at the stage of "Motivation, setting the problem" (Abdullayeva, 2020).

At this stage, the teacher determines the level of preparation according to the implemented standard. This is of great importance for efficient use of class time and effective organization of teaching. In the first stage of the lesson, by asking diagnostic questions according to the taught topic, students' knowledge and skills on the topic are revealed and it is determined which point should be emphasized more, and unnecessary repetitions are not allowed. The correct selection of the tasks presented to the students at the stage of "Motivation, setting the problem" lays the groundwork for the realization of the diagnostic assessment (Kahramanova, Karimov, & Huseynov, 2022).

In order to perform a diagnostic assessment effectively, several principles that influence the appropriate selection of tasks should be considered. For example, in the 6th grade, "Angle. Circle. The following principles should be taken into account in order to propose tasks that will attract the attention of students and activate them during the implementation of standards related to "Symmetry" (Ismayilova & Huseynova, 2021) educational unit:

1. *Reference to existing knowledge:* Provide tasks that are linked to new topics, taking into account students' prior knowledge. For example, in "Angles," give students tasks that require them to recognize and compare different types of angles based on their prior knowledge.

2. *Relation to daily life:* Tasks should be related to situations encountered in daily life. For example, in Circumference, provide students with tasks that require them to measure and calculate the length of the circumference of an object (eg, a ring, a digital clock, a pizza).

3. *Practical application:* Prepare exercises that test the application of theoretical knowledge in practical situations. For example, in Symmetry, challenge students to create or find symmetrical drawings that will reinforce their understanding of symmetry.

4. *Different types of tasks:* Include different types of tasks to develop different skills of

students. For example, provide different types of tasks, such as solving math problems, drawing angles and circles, giving oral explanations, or group discussions.

5. *Clear text and examples:* Texts of tasks should be clear and understandable. Providing examples for each task makes it easier for students to see how to complete the task. For example, in the topic "Circumference", give tasks according to the example to calculate the length of the circle.

6. *Increasing students' motivation and interest:* Tasks should be designed in such a way as to attract students' interest and motivate them. For example, in the topic "Angle", presenting students with various fun tasks (eg geometric puzzles) will increase their interest in the learning process. Puzzles are usually built around various geometric shapes (triangles, circles, squares, etc.) or objects. For example, problems such as dividing a circle in a certain shape or calculating the measures of different angles may be given.

7. *Targeting key skills:* Target key skills when selecting assignments and monitor the development of these skills. For example, in the topic "Symmetry", finding and describing symmetrical objects will ensure the development of the concept of symmetry.

Selection of tasks taking into account these principles will contribute to a more effective implementation of diagnostic assessment and a more objective assessment of student's knowledge and skills (Hajiyeva, 2009).

In the 8th grade, during the teaching of the subjects included in the "Environment" educational unit (Kahramanova, Karimov & Huseynov, 2019), a diagnostic assessment can be made by referring to the knowledge known to the students from the 6th grade.

Because diagnostic assessment precedes all assessments, it reveals what students have learned before and also in lower grades for the current situation. For example, before starting the "Functions" educational unit in the 10th grade (Kahramanova, Karimov, & Huseynov, 2022), it is possible to determine what knowledge the students have about function assignment methods, linear function,  $y = x^2$ ,  $y = \sqrt{x}$ ,  $y = ax^2 + bx + c$ ,  $y = |x|$ ,  $y = x^3$  functions and have acquired skills.

Tasks designed for diagnostic assessment can also be used to determine what students have learned at the end of the unit. However, the use of these assessment tasks in the end does not mean that we are conducting a re-diagnostic assessment. This type of use has another advantage: students check their initial knowledge of a new section, and after passing and mastering the section, they can repeat the same question or test and compare their results, and thus they can measure themselves at what level they have mastered the solution of the problem. This type of testing is good for students psychologically as they strive to achieve. Diagnostic assessment is not based on a specific score or a number indicating the number of correct answers and does not affect the student's final assessment (Sharifov, 2006).

### **Diagnostic Assessment Tools**

It is appropriate to use the following tools in the diagnostic assessment in mathematics classes:

- Assignments prepared and presented by the teacher;
- Questionnaires used to test theoretical knowledge;
- BİBÖ (I know, I want to know and I have learned) table;
- Observing problem-based class discussion, etc.

Before diagnostic assessment tools are developed, basic skills are defined according to the expected learning outcomes at the end of the classes in the subjects. Based on those basic skills, measurable evaluation criteria are determined. Evaluation tools are prepared according to the established criteria and indicators. Diagnostic assessment tools are composed of tasks of different degrees of difficulty-easy, medium, and difficult (Javadov, 2014).

### **Conclusion**

In-school assessment realizes the learning results according to the content lines of the curriculum for the educational levels; it creates a real foundation for continuing mathematical education and learning other subjects; and creates real opportunities for our students to acquire knowledge, skills, and habits necessary for applying mathematical knowledge in practical activities.

Diagnostic assessment is an important tool to better understand students' knowledge and skills in mathematics classes and to make the teaching process more efficient.

The diagnostic assessment determines the training strategies, forms, and methods of training organization, enables the effective preparation of the lesson to improve the learning results of the students. Diagnostic assessment helps teachers to develop an effective teaching plan for the learning process.

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