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Methodology of Integrated Science Teaching in School Education

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Abstract: the article analyzes the issues of the method of integrated teaching of specific subjects in school education.
Key words: school, education, subjects, integration, teaching, knowledge, understanding, competence.

Maktab Ta’limida Aniq Fanlarni Integratsion O‘Qitish Metodikasi

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Annotatsiya: maqolada maktab ta’limida aniq fanlarni integratsion o‘qitish metodikasi masalalari tahlil qilingan.
Kalit so‘zlar: maktab, ta’lim, fanlar, integratsiya, o‘qitish, bilim, tushuncha , malaka.

In the development strategy of New Uzbekistan for 2022-2026, the tasks of achieving quality indicators in general secondary education are set [1]. For this reason, the plans of school education subjects were revised, and new generation curricula were created based on the experience of foreign countries and the requirements of international educational programs. Starting from the 2023-2024 academic year, new textbooks developed on the basis of such programs have been implemented at the stage of primary education. In this process, the teaching of educational subjects in an integrated form is also important. Here, we draw your attention to the analysis of the methodology of integrated teaching of specific subjects in school education.

Content of integrated education. The term "integration" comes from Latin and means in cooperation, connection and sequence [2]. In this respect, integrated teaching is a form of teaching subjects in interdependence and logical harmony. According to our approach, integrated teaching leads to the strengthening of the content and quality of education, to the improvement of learning indicators of learners. Therefore, the integrated teaching of academic subjects taught in school education today is an important issue.

Today, 16 academic subjects are taught in secondary schools of our country. Starting from the 2024-2025 academic year, it is planned to reduce the number of these subjects to 11 [3]. For this reason, it is appropriate to rely on the following form of integrated teaching of academic subjects from the experience of foreign countries:

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1) Chemistry- Biology form;
2) Mathematics-Physics-Informatics form;
3) Mathematics-Foreign language form;
4) Mother tongue and Literature-Foreign language form[4].

Such an integrated teaching mechanism provides students with opportunities for in-depth teaching of academic subjects and strengthening their mastery. Therefore, it is worth mentioning that it is urgent to create scientific and methodical researches in this matter.

The basis of integrated teaching of exact sciences. Today, the most important specific subjects such as Mathematics, Informatics, and Astronomy are taught in secondary schools of our country. It should be noted that the programs and textbooks of Mathematics have been adapted to the requirements of international educational programs. In this regard, it is necessary to improve the programs and textbooks of other specific subjects in school education.

According to our approach, in the integrated teaching of specific subjects in school education, it is appropriate to base on the following:

1) coherence of topics;
2) integrity of educational materials;
3) textbooks have a logical system.

It is desirable that the topics of specific subjects be structured based on the principle of mutual coherence in the cross-section of classes. For example, the subjects of mathematics from the 1st grade to the 11th grade will be integrated and their complexity will increase across the grades. Students' mastery of subjects based on the principle of such coherence allows for gradual development of their mathematical thinking.

It is important that the educational materials of specific subjects taught in school education are arranged on the basis of the principle of continuity. According to him, educational materials should improve and become more complex in the section of classes. For example, the 1st grade Mathematics curriculum should become more complex in the following primary grades. Based on the age, physical, mental and spiritual capabilities of the students, educational materials are improved and placed in the section of classes. It should be noted that in the 5th-7th grades, it is intended to provide knowledge on the basic principles of specific sciences. Therefore, it is appropriate to prepare the educational materials of these classes covering the most fundamental foundations of specific subjects and to place them in the section of the classes.

Pedagogical scientists in many cases rely on the experiences of foreign countries to solve certain problems related to teaching. It's good. However, according to our approach, we should have our national experience in the integrated teaching of specific subjects. For this purpose, the preparation of educational materials combining the national experience of teaching specific subjects, the requirements of international educational programs, and the experiences of foreign countries will bring the expected results. For example, TIMSS, PIRLS and STEAM international educational programs require a correct understanding of the essence of mathematical problems, creative thinking and independent action. Based on these requirements, the preparation of educational materials of specific subjects is the basis for students to acquire these skills. As a result, the national experience of teaching specific subjects will be formed in the future.

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Evaluation of the effectiveness of integrated teaching of specific subjects. The effectiveness of specific subjects taught in school education is reflected in the students' mastery rates. For this reason, it is appropriate to rely on special approaches in assessing the level of students' mastery. According to our approach to this issue, relying on different forms of assessment in assessing students' mastery has the expected effect. The main types of such forms are:

1) traditional assessment form;
2) non-traditional assessment form;
3) individual assessment form.

The traditional form of assessing students' mastery is widely popular. In it, grades of "unsatisfactory", "satisfactory", "good" and "excellent" are given depending on the students' mastery of the topic. In this case, the main focus is on students' mastery of the subject, so the evaluation of their independent and creative thinking skills falls to the second level. For this reason, in recent times, efforts are being made to improve the traditional form of assessment of students' learning level [5].

In school education, it is important to assess the level of mastery of specific subjects in the integrated teaching in an unconventional way. The basics of this form are as follows:

a) understanding and mastering the subject;
b) having independent and creative skills on the subject;
c) how the subject is perceived by the student.

In this case, the students' level of learning is evaluated as "positive" or "negative". The main goal is to develop the ability of students to understand, think independently and think creatively through the topic. For this reason, students in specific subjects are instructed to create a problem, assignment or development for non-traditional assessment. Such tasks are based on the content of the subjects. Based on how the students completed the assignment, their level of mastery is evaluated.

It should be noted that the number of experienced teachers in our country is increasing. Such teachers are gaining individual experience as a result of working on themselves, striving for new things, and assimilating the scientific recommendations presented through research. In this regard, future teachers must master these skills in the process of higher pedagogical education. Experienced teachers experimentally assess the level of students' learning based on an individual approach. It should be noted that the following are taken into account in such an individual assessment:

a) student's interest in specific subjects;
b) student's activity during the lesson;
c) independent performance of the assigned task by the student;
g) the student's ability to work with information.

Based on these principles, the students' mastery level is assessed individually. In this sense, the individual form of evaluation allows to strengthen the process of teaching specific subjects in an integrated form in school education and to deepen the mastery indicators.

If you pay attention, there is a unique method of integrated teaching of specific subjects in school education. At the same time, it is necessary to develop specific mechanisms of this methodology. For this, in our opinion, it is important to implement the following:

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1) development of science-based mechanisms of integrated teaching of specific subjects;
2) in the development of such mechanisms, based on the conclusions of scientific research carried out in specific subjects and individual assessment forms of experienced teachers;
3) test the developed mechanisms for at least one academic year;
4) implementation of a set of scientific studies in higher pedagogical educational institutions on the basis of integrated teaching of specific subjects.

Such an approach leads to the acquisition of integrated practical foundations of teaching specific subjects in school education.

When the time comes, it should be noted that the attitude of students to specific subjects in our country has the following characteristics:

a) students have a high level of interest in specific subjects;
b) students' mastery of concrete subjects is also high;
c) students have the ability to use what they have learned from specific subjects wisely (for example, they have been winning prizes at national and international science Olympiads).

Therefore, it is possible to achieve the quality of the educational process and learning indicators by developing the methodology of teaching specific subjects in an integrated form.

Thus, it is important to improve the methodology of integrated teaching of specific subjects in school education, to develop its practical mechanisms, and to create scientific and methodical developments on the system of evaluating the level of students' mastery of these subjects in innovative ways. In this matter, mutual cooperation of pedagogic scientists is urgent.

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