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The peculiarities of block-modular approach to teaching biology at secondary school

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ABSTRACT

The essence of the modular teaching consists in independent achievement of a specific educational-cognitive goal by a pupil in the course of work. A module is an educational program, individualized by the content, teaching methods, level of independence and rate of the educational-cognitive activity. As one of the productive pedagogy-methodological techniques the block/modular teaching, considering individual abilities of pupils, contributes to improvement of the educational process. To use the block-modular teaching, a teacher should first group the study material into integral, logically bracketed, complete blocks, comprising 3-6 lessons each.

The methodology of the block study of the material has its advantages as compared to traditional methods: the key points are clearly defined in the study material and are subject to multiple processing; the material is divided into large blocks, which make it possible to consider the material being studied as a whole entity; new material is discussed at all lessons; pupils come to knowledge solely in the course of the lesson, through unassisted work with a book; a task for self-work can be separated; various types of knowledge testing are combined, providing for a pupil's grade assessment in all topics; homework is minimized; availability of standardized lessons within a block allows improving the methodology of their conduct.

1. Introduction

The evolution of the block method of education is block-modular teaching. The essence of the modular teaching consists in independent achievement of a specific educational-cognitive goal by a pupil in the course of work. A module is an active unit, combining a goal plan of activity, education content, and skills aimed at perception of this content. A module is an educational program, individualized by the content, teaching methods, level of independence, rate of the educational-cognitive activity (Vartanyan et al. 2014).

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To use the block-modular teaching, a teacher should first group the study material into integral, logically bracketed, complete blocks, comprising 3-6 lessons each.

The block-modular teaching, one of the productive pedagogy- methodological techniques, which, considering individual abilities of pupils, contributes to improvement of the educational process. Determination of differentiated tasks inside a module enables pupils with different abilities to fully reveal the level of their preparedness.

Depending on the logical structure and the lesson volume, it can consist of two or three blocks. It is assumed that three types of lessons are grouped in each block:

- General teaching lesson
- Self-instruction lesson
- Systematization and generalization lesson (Konyushko et al. 2004).

The general teaching lesson, depending on age and individual features, can have a form of a school lecture, conversation or narration. During the lesson, the teacher explains the entire volume of the study material, included in the block, in a generalized and brief manner. Such lesson consists of three parts:

- introduction, duration of 5-7 minutes,
- main part, duration of 30 minutes,
- conclusive part - 7 minutes (Konyushko et al. 2004).

In the introduction, the teacher presents the estimated plan of the material being studied, laying emphasis on major items of the topic content. Further, the teacher explains the main content (essence) of the material being studied and attempts to establish a connection between the materials being studied and studied earlier. At the end of the lesson, he/she summarizes the material presented and dictates the main and basic issues and concepts to be put down in biology notebooks (Gyulazyan et al. 2009; Krupenin et al. 1995; Konyushko et al. 2004).

It turns out that the teacher addresses the main, basic issues of the material being studies three times within one lesson. At the end of the lesson, the teacher dictates a list of required literature to the pupils, including the school textbook (Konyushko et al. 2004).

After this lesson, the teacher conducts several lessons of self-instruction, at which pupils, using a tutorial, develop that portion of the material, of which they got general information. The pupil also does several sums, aiding in reinforcement of the knowledge gained. According to the information presented by several authors, a self-instruction lesson, in its turn, can consist of three parts:

- introduction – up to 7 minutes,
- instruction – up to 25 minutes,
- testing - 12-15 minutes (Konyushko et al. 2004). In the introduction to self-instruction, the teacher introduces the program of work to schoolchildren and holds consultation in case of need. The introductory part of the lesson is working with a tutorial or a book. The teacher supervises the work in accordance with the pre-developed program, including elements of diverse complexity: ”A”.”B”,”C”. Task ”A” of the program has a reproductive nature. While fulfilling it, pupils get the level of knowledge, which enables them to reproduce the study material. Such task should be available for all pupils in the class, as it allows acquiring knowledge about the main portion of the material content. During this

part of the lesson, pupils answer the questions ”What?”, ”Where?’’, “How many (much)?” Part ”B” of the task is half-search in its nature. It implies a more profound and well-thought development of the material being studies. This art of the task should be available for more than half of pupils in the class. During this part of the lesson, pupils answer the questions “Why?’’, “How?’’.

Implementation of the third part ”C” of the task makes it possible to reveal creative capabilities of the pupils, apply the knowledge obtained. In this part of the lesson, the teacher asks questions of different complexity. The pupil chooses a question, an answer to which he is able and wish to give. For group work, he/she can consult the group members, and for individual work, he/she consults the teacher. The tasks should be chosen so that the tutorial had no specific answers to the questions, but, at the same time, the tutorial should contain the materials, which will help to formulate the answer.

The block ends with a systematization and generalization lesson. It is deemed a thematic credit, during which all the knowledge acquired in this block is tested. This lesson consists of two parts:

- instruction – up to 15 minutes,
- testing – up to 30 minutes.

During the first part of the lesson, the pupils, assisted by the teacher, review questions of the topic, and during the second part – give written answers to a number of questions, solve biological problems. Unlike the self-instruction lesson, in this case the teacher asks the similar questions to all pupils, which help to implement the topical testing of the knowledge acquired.

Below is the system of lessons for Form 5, topic “Flower” (Table 1), and Form 9, topic “Blood and Lymph Circulation” in the subject of biology (Table 2) (Sisakyan et al. 1999; Amiryan et al. 2014) .

Table 1. Lesson system of topic “Flower”

Topic and number of the lesson	Lesson type
Block 1	
1. Flower formation	Lesson of general topic teaching;
2. Unisexual, bisexual, nonsexual flowers. Monoecious, dioecious plants. Actinomorphic and zygomorphic flowers.	Self-instruction lesson;
3. Inflorescences. Their biological value.	Practical work;
	Self-instruction lesson;
Block 2	Lesson of general topic teaching;
4. Pollination	Self-instruction lesson;
5. Double fertilization of flowering plants	Practical work;
	Self-instruction lesson;
	Systematization and generalization lesson.

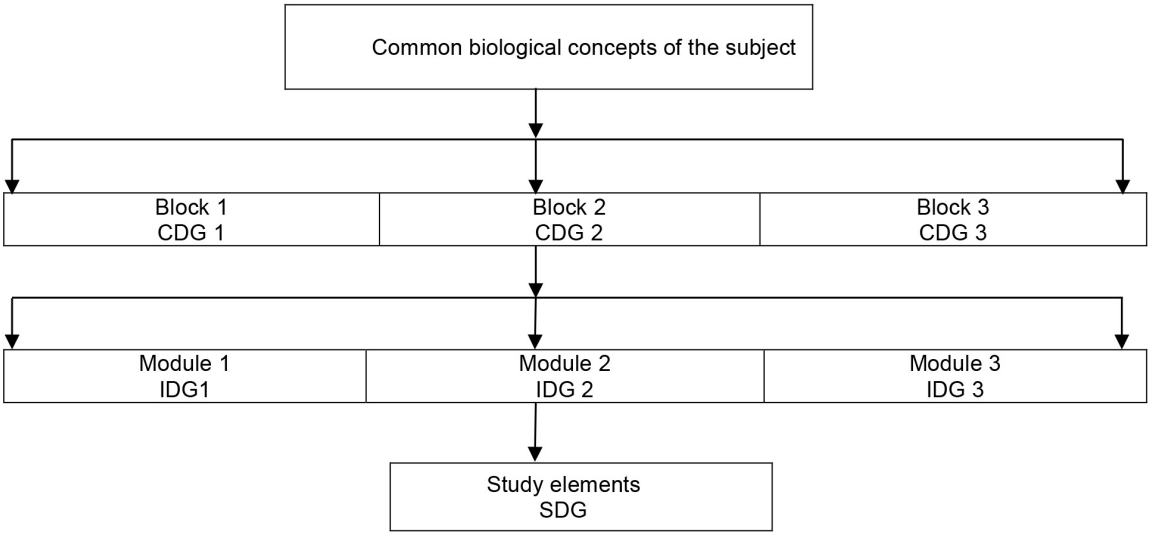
Table 2. Lesson system of topic "Cardiovascular System. Blood and Lymph Circulation"11

Topic and number of the lesson	Lesson type
Block 1	
1. Blood and Lymph Circulation	Lesson of general topic teaching;
2. Blood flow in vessels	Self-instruction lesson;
3. Measuring blood flow rate in vessels	Practical work;
Block 2	
4. Blood pressure	Lesson of general topic teaching;
5. Cardiovascular system hygiene	Self-instruction lesson;
6. Assessment of cardiovascular system activity	Practical work;
7. First aid at bleedings and cardiovascular diseases	Systematization and generalization lesson.

In the course of the block-modular teaching, the teacher's subsequent steps are as follows:

1. First, to single out the main scientific concepts of the subject. For example, the main concepts of biology in Form 9 are: main human tissues, organs-systems, their anatomical organization and specific features of physiological functioning, nerve and humoral regulation, diseases.
2. The content of the study material around these concepts should be divided into logically bracketed blocks. Each block has its inherent complex didactic goal (CDG).
3. 3. One or several modules are formed in each block. Each module has its integrated didactic goal (IDG). The IDG provision leads to the complex didactic goal (CDG).
4. Several study elements (SE) are singled out inside each module, which may correspond to the lesson phases. A specific didactic goal (SDG) corresponds to each study element. Each study element is a step to achievement of the integrated goal of the lesson (Scheme 1).

Scheme 1. Block-modular program structure (Konyushko et al. 2004) .



The module structure includes:

1. a cognitive task, which is the goal of the module study.
2. biological content, selected in accordance with the goal.
3. methodological instructive regulations, which should be observed in order to achieve the goal.
4. information about teaching aids.
5. generalizing element, comprised of a conclusion, key words etc.
6. any testing type.
7. homework content during the lesson.

The modules shall be introduced in the academic activity step-by-step. One should start from separate modules, which will show efficiency of their introduction. The transfer to the block-modular teaching is connected with certain conditions:

a teacher's preparedness to teach material in large blocks,

pupils' preparedness for independent educational-cognitive activity,

scientific-technical facilities of the school (Vartanyan et al. 2014) .

The methodology of the block study of the material has its advantages as compared to traditional methods:

- the key points are clearly defined in the study material and are subject to multiple processing,
- the material is divided into large blocks, which make it possible to consider the material being studied as a whole entity,
- new material is discussed at all lessons,
- pupils come to knowledge solely in the course of the lesson, through unassisted work with a book,
- a task for self-work can be separated,
- various types of knowledge testing are combined, providing for a pupil's grade assessment in all topics,
- homework is minimized,
- availability of standardized lessons within a block allows improving the methodology of their conduct.

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