

# Modular Teaching Technology Based on Scientific Activity



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**Abstract**—the article is based on analyzing the effectiveness of implementing modular training technology in teaching process and in the process of scientific activity. As well as, author analyses the steps of its usage. A module is a separate unit that includes theoretical material, training tasks, and methodological recommendations for students. The constituent element of the module is control questions and tests, as well as keys for self-checking or mutual checking. By studying the module, students achieve a specific didactic or pedagogical goal. The content of the training session is constructed from several logically interconnected modules, each of which solves a specific educational task. The execution of the module is given a fixed time. Together, all modular blocks are aimed at achieving substantive and personal results. The module is an independent structural unit, which in some cases allows individual students to listen to not the entire course, but only a number of modules. This allows you to optimally plan the individual and independent work of gifted students.

For the active introduction of modular learning technology, it is necessary to increase student motivation. Pupils should have a well-developed ability of independent cognitive activity. It is important that the material base of the educational institution makes it possible to provide students with individual sets for working in modular lessons.

**Key words:** module, individual, independent, academic, lectures, science, training, specialists, continuity of teaching.

## I. INTRODUCTION

Technology of modular training based on scientific activity involves the use of module methodologies in the science education system. It is desirable to apply such modular training technology in the system of higher

education, as well as in the system of professional development of teachers and engineers.

In modular learning technology based on a science-based approach, the module includes:

- Fundamental concepts in a subject matter - a specific event, or law or chapter, or a major topic or group of related concepts
- to study (master) one or more fundamental concepts of a subject.

## II. RESEARCH METHODOLOGY

Typically, the module consists of 3 to 6 hours of lecture and related practical (seminar) and laboratory classes.

Based on the rigorous systematic (multifaceted) analysis of science explanatory apparatus, the most effective module is developed. It allows you to group the basic phrases, logically and compactly organize the material. Because the module is an independent unit, in some cases it gives individual students the opportunity to listen to only a number of modules, not the entire subject. This allows for the optimal planning of individual and independent work of gifted students (Sayidahmedov N. 1999).

## III. RESULTS & DISCUSSIONS

In modular training, there is an opportunity to differentiate teaching through a comprehensive, concise and in-depth classification of curricula, ie individualization of teaching. Transition to modular training has the following objectives:

- ensuring continuity of teaching (between subjects and between subjects);
- individualization of training;
- Creating adequate conditions for independent study of learning material;
- Accelerate learning;
- achievement of effective development of science.

Thus, modular teaching will create the necessary conditions for students to acquire knowledge according to their abilities. The effectiveness of the transition to the module training system depends on the following factors:

- level of material and technical base of educational institution;
- Qualification level of the teaching staff;
- student readiness level;
- evaluation of the intended results;
- development of didactic materials;
- analysis of results and optimization of modules.

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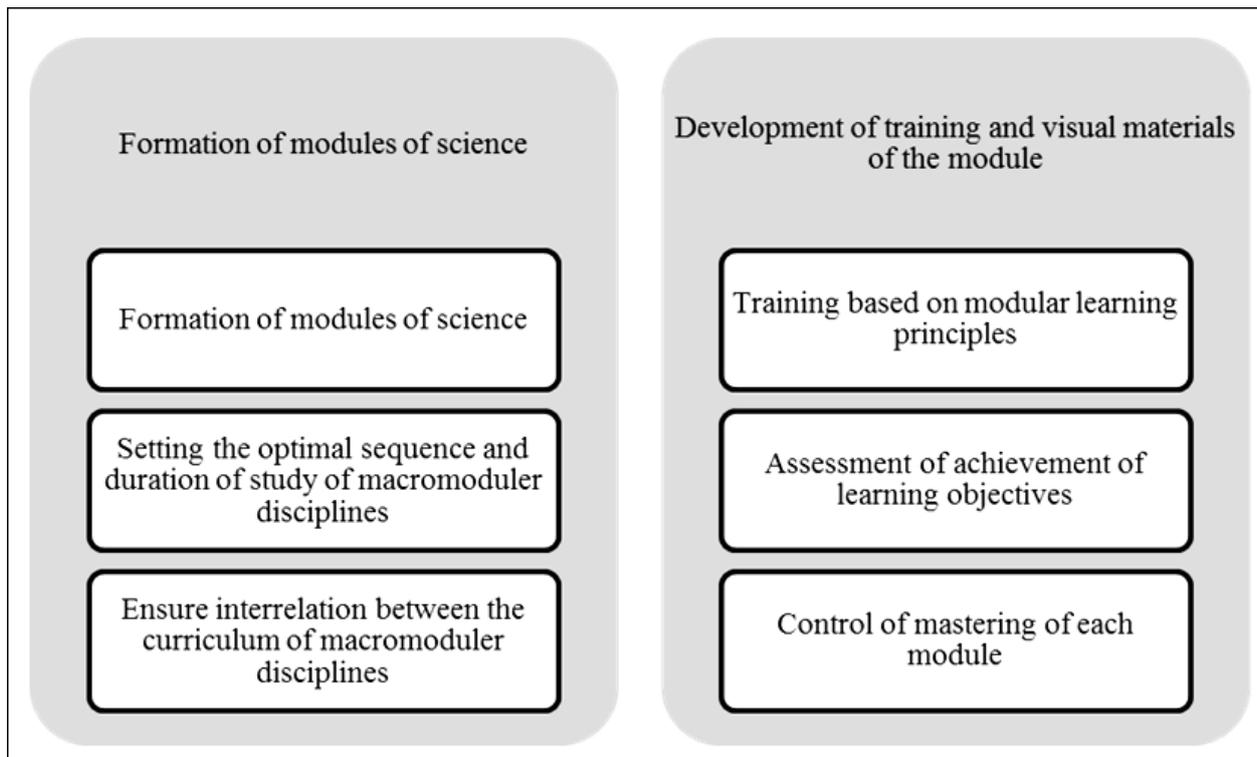
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The transition to modular training involves:  
Based on an in-depth analysis of the working curriculum, a group of interdependent disciplines is identified, i.e. the

whole curriculum is considered as a separate set of macro modules (Figure 1).



**Figure 1. Modular teaching technology scheme based on scientific activity**

In most cases, the following three types of macro modules can be formed:

- a) including humanitarian sciences;
- b) economic sciences;
- c) including general education, technical and vocational education and specialization subjects.

Each macro module has its own purpose and function in forming an expert. The purpose of studying a particular macro module stems from the learning objectives of the disciplines included (Nishonaliev U. N. 2200).

The set of objectives for the study of each macro module is the main objective of specialist training as outlined in the State Educational Standards. The purpose of each macro module is clear and should be communicated to students as soon as the first subject is studied. As each subsequent macro module course begins to be studied, the learning objectives of the subject are brought to students' notice;

Within each macro module, the optimal sequence of the studied subjects and the timeframe for their study are established. In other words, it is necessary to ensure continuity of training and to reduce the time required for the study of disciplines and thereby to reduce the timeframe for studying macromolecules. Less than the number of study hours (1-2 hours per week, sometimes 3-hour classroom sessions) should be included in the list of block disciplines and may take place in the first or second half of the semester (Borodina N.V., 1998).

Macro modules are formed on the basis of vertical close interactions, but the horizontal links between macro modules should be taken into account when determining the timing of their study.

The working curriculum of the subject is revised at the expense of grouping individual topics in the module. For each module, objectives should be formulated with theoretical and practical implications.

The module may include 2-3 lectures and practical lessons and laboratory work related to these lectures. The following materials are provided for each module:

- tests for controlling students' knowledge;
- assignments for individual work;
- assignments for independent work;
- educational and methodical handouts;
- List of educational and scientific literature;
- working curriculum.

Each module must be completed by testing: for the current module, this will be the control of the input material, and the next module will be an entry (initial) control. For each module, a set of handouts and illustrative materials will be created, which will be given to the student before the workshop. The module is provided with a set of recommended exhibition materials and literature, with each material absorbing and moving from one module to the other. Talented students can pass the test without depending on others. The role of a teacher can range from an informant-supervisor to a consultant-coordinator. The advisor-coordinator role of the teacher is manifested when teaching is based on the training modules.

The training module is the content of the training on the unit of the module, the control system of the student's learning behavior, the system of knowledge control over the specific content, and the content of methodological developments.

Developing training modules is a complex process, which requires a lot of time and summarizes a large number of methodological experiences. However, their application in practice can make teaching more effective (Lavrentiev G.V. 1994).

Modular training requires the delivery of complex and informative lectures on general science topics. Lectures should focus on developing students' creative abilities. Practical and laboratory studies of the module are combined with lectures that complement the content of the lectures with new material to be explored. Students will gain practical skills.

For the preparation of the text of lectures, it is advisable to use the methods of structuring and systematization, to present the materials in the form of block diagrams, blocks of images. At the same time, the efficiency of the material is increased because:

- understandable purpose of the module;
- links and transitions between the elements of the learning material are clearly indicated;
- The main features are highlighted;
- The entire volume of the learning material (module) is clearly visible to the learner.

The module aims at "compressing" the information, first of all, in structuring the content of the learning material. Efforts should be made to ensure that knowledge is presented fully and easily.

When learning information is transmitted simultaneously in four forms - figurative, numerical, symbolic and verbal, the most robust acquisition is achieved.

In modular learning, this is the basis. For each module, it is advisable to place symbolic symbols (in the form of questions) in the picture blocks, to illustrate questions in the form of pictures, to provide formulas, tables, graphs, and methodical instructions.

In general, a block of paintings, block diagrams and other visual aids can serve as handouts for students. At the same time, it is advisable to create an explanatory dictionary for each subject, including module. To improve the effectiveness of modular training, it is advisable to use the following methods of training: brainstorming, problem-solving, heuristic (question-and-answer) conversations, educational games, and more.

#### IV.CONCLUSION

Thus, the transition to modular training will be done in the following sequence:

Stage I: The division of disciplines into macro modules.

Stage II: Establish the optimal sequence for learning science when the learning cycle is compressed.

Stage III: Ensure interdependence of the curriculum for macro module Sciences.

Stage IV: Formation of module modules.

Stage V: Development of training and demonstration material for the module

Stage VI: Design of teaching technology based on modular

learning principles.

Stage VII: Develop a schedule of lessons, taking into account the optimal number of subjects studied at the same time.

The organization of the learning process can be viewed as an integral part of the modular learning system.

One of the features of the modular learning system is the acceleration of the learning process, which can be explained in two aspects.

"Compression" of educational information based on the principles of modular learning in the learning process;

Optimizing the training schedule and the timetable based on 'compression' of the learning period.

Form of effective organization of the educational process is weekly modular planning of lessons and rating of knowledge of students. That is, one module (2-3 lectures and their practical and laboratory work) should be scheduled for one week, which should be completed by assessing student knowledge through tests or other forms of control.

The following benefits can be obtained by the content of the module:

- ensuring continuity of learning between modules and interdisciplinary modules;
- establishment of methodological justifications for all types of training within each module and between them;
- flexibility of the module structure of science;
- regular and effective monitoring of students' knowledge (after each module);
- stratification according to the students' immediate abilities (after the initial modules, the teacher may recommend individual students to master the subject);
- Optimizing the hours allocated for lecture, practice (practice), individual and independent work as a result of "compression" of information, accelerating learning, effective use of classroom hours, and classroom content. As a result, the learner will have sufficient knowledge, skills and qualifications.

The modular learning technology based on scientific activity is implemented through pedagogical and technological maps developed for each module.

Thus, training of highly qualified specialists using module training is provided on the basis of:

- Continuity of teaching (which increases the effectiveness of learning subjects);
- Accelerated learning as a result, much of the information is absorbed through computer networks, both individually and independently;
- Individualization of learning (the learner will have the opportunity to learn according to his abilities).
- Providing sequential mastering of modules designed for a particular subject, taking into account the activities of an expert is the essence of modular teaching technology based on a science approach. Optimization of this learning process allows adaptation and individualization of teaching.

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