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Integration Of Knowledge Control Of Students With The Help Of Inter-Subject Links When Studying General Professional Disciplines

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ABSTRACT

This article reveals the integration of students' knowledge control with the help of interdisciplinary connections in the study of general professional disciplines. Methods and methods of control of students' knowledge with the help of integrative tests in the study of general professional disciplines are proposed on the example of the course of metrology, standardization and interchangeability.

KEYWORDS

Interdisciplinary connections, integration, knowledge control, integrative tests, general professional disciplines, special disciplines, interchangeability, tolerances and fits, materials science, machine parts, mechanical engineering technology.

INTRODUCTION

The interest in the problem of interdisciplinary connections is not accidental: the modern requirements of the labor market presuppose significant changes in the content and methods of teaching. These changes are caused by important processes of modern development of sciences – their integration and differentiation. Fundamental knowledge inherent in general education develops with the acquisition of general ideas in production. Knowledge acquires specific content thanks to technical education that carries information about specific production processes.

For the identification and successful functioning of interdisciplinary integration links, it is necessary not only to determine the sequence of transmission of educational information; to formulate learning objectives by stages in the form of skills and abilities; make a scientifically grounded selection of the

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content of educational material, taking into account specialization; think over a system of methods and means corresponding to each stage of training, but also take into account such factors as the level of development of cognitive interest, learning conditions, knowledge control and many other factors affecting the quality of knowledge assimilation. This means that the use of interdisciplinary connections in the real educational process depends on many factors, without which it is impossible to build the learning process on an integration basis.

The systematic application of interdisciplinary connections of general educational, general technical and special disciplines develops horizons, depth of thinking, promotes rapid perception of the phenomena of the studied material and helps to develop the skills of using potential knowledge in applied disciplines [1].

Consequently, the systematic assimilation of the material, the formation of the skills and abilities of students is largely ensured by the implementation of intersubject connections, which are an important condition for the strength and effectiveness of the knowledge being formed. Of particular importance are interdisciplinary connections in the system of higher technical education, where the educational and cognitive process should be built in organic connection with general educational, general technical and special disciplines [2].

MAIN PART

When teaching general professional and special disciplines, interdisciplinary connections are a concrete expression of the integration processes taking place today in science and the life of society. These connections play an important role in improving the practical and scientific-theoretical training of students, an essential feature of which is their mastery of the generalized nature of cognitive activity. Generalization makes it possible to apply knowledge and skill in specific situations, when considering particular issues, both in educational and production activities.

With the help of multilateral interdisciplinary connections, not only at a qualitatively new level, the tasks of training, development and education of students are solved, but also the foundation is laid for a comprehensive vision, approach and solution of complex problems of reality.

That is why interdisciplinary connections are an important condition and result of an integrated approach in teaching and upbringing of students studying in higher educational institutions.

In industrial production, first of all, general technical and general professional knowledge and skills are needed, in particular, a design engineer, a process engineer, a mechanical engineer, technicians, technologists and other specialists [3].

General professional training includes knowledge of structural materials, fundamentals of product design, interchangeability, tolerances and fit of parts of typical joints of machines and mechanisms, technologies for manufacturing parts and

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assembling products, strength calculations of structural elements, test procedures, etc.

The aim of the study is to scientifically substantiate, develop and apply one of the methods of integrating the control of students' knowledge with the help of interdisciplinary connections in the study of general professional disciplines on the example of the course "Metrology, standardization and interchangeability", aimed at improving the professional orientation of teaching students to future specialists at a university.

We have studied works devoted to the study of how and to what extent the quality of specialist training is determined by interdisciplinary connections – these are the works of E.N. Dolgikh, A.M. Dubrova, N.A. Klimova, L.I. Troshina and others.

Based on the analysis of these approaches, intersubject connections are a general didactic concept that has a different status in didactics, namely:

- Interdisciplinary connections are a reflection of inter-scientific connections in the educational process (at the level of a didactic phenomenon);
- Interdisciplinary communications are a means of ensuring the mutual consistency of curricula and textbooks in different disciplines in order to improve the scientific level of teaching the foundations of science, develop creative abilities.
- Interdisciplinary connections are an integrating link in the system of didactic principles: scientific, systematic, integrity, continuity, etc.

Of particular importance are interdisciplinary connections in the system of training bachelors of a technical direction, where the educational and cognitive process should be built in organic connection with general technical, general professional and special disciplines [3].

There are three models of interdisciplinary relationships:

1. General technical disciplines - special disciplines;
2. General professional disciplines - special disciplines;
3. Special disciplines - special disciplines.

The systematic application of interdisciplinary communications of general technical, general professional and special disciplines develops horizons, depth of thinking, promotes rapid perception of the material being studied and helps to develop the skills of using potential knowledge in applied disciplines of interchangeability of parts of typical connections [4].

When establishing and implementing interdisciplinary connections, it is necessary:

1. Based on the topic, clearly formulate the educational and cognitive goal and educational, developmental and educational tasks aimed at mastering the leading positions and basic knowledge of the topic under study;

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2. Ensure students' activity in the application of knowledge from other general professional disciplines;

3. Explain causal relationships, the essence of the topics studied, the interchangeability of parts of typical connections;

4. Contain generalized conclusions based on the connection of knowledge from different disciplines;

5. Aim at generalization of certain sections of educational material studied in different general professional disciplines.

We have developed various forms of organization of training, providing the functions of interdisciplinary connections: complex homework, cases, complex test questions, training conference, multimedia lesson, problem classes.

The course "Metrology, standardization and interchangeability" is the logical conclusion of the cycle of general technical disciplines: theory of mechanisms and machines, technology of structural materials, resistance of materials and machine parts. The discipline "Metrology, standardization and interchangeability" teaches to consider the tasks of improving the quality of manufacturing in mechanical engineering, operation and repair of machines and mechanisms in a comprehensive manner from the standpoint of standardization, ensuring interchangeability and control of established technical requirements [3].

The pedagogical literature widely discusses the methodology for the development of test control technologies and their implementation in pedagogical practice (V.S. Avanesova, K. Ingenkamp, Paul Kline, A.M. Maiorov, L. Doliner, etc.), but it should be noted that in scientific and methodological literature lacks the necessary materials for teachers [5].

Therefore, it is necessary to highlight the main criteria for the design of tests, to clarify the possibilities of using test items in the process of studying the discipline "Metrology, standardization and interchangeability" and to create an appropriate system of test items.

Integration of control of students 'knowledge with the help of interdisciplinary connections in the study of general professional disciplines makes it possible to assess students' knowledge in a wide range of areas of education. For this, we have developed and experimented with integrative tests using interdisciplinary communications of general professional disciplines.

An integrative test can be called a test consisting of a system of tasks that meet the requirements of integrative content, a test form, an increasing difficulty of tasks aimed at a generalized final diagnosis of students' readiness. Diagnostics is carried out by presenting such tasks, the correct answers to which require integrated (generalized, clearly interrelated) knowledge of two or more academic disciplines [6].

The creation of such tests is given only to those teachers who have knowledge of a number of academic disciplines, understand the important role of interdisciplinary connections in learning, are able to create

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assignments, the correct answers to which require students to have knowledge of various disciplines and the ability to apply such knowledge.

We have developed integrative tests using interdisciplinary connections of general professional disciplines, such as descriptive geometry and engineering graphics, theory of mechanisms and machines, technology of structural materials, materials science, strength of materials and machine parts. Below are some options for integrative tests:

1. Rolling bearings are made of steel grade ..., produced with accuracy classes ... and indicated in the drawing.

A. SH (materials science), 0,6,5,4,2 (metrology, standardization and interchangeability), shaft and hole tolerances (descriptive geometry and engineering graphics) [7,8].

B. Steel 40X (materials science), 0-17 (metrology, standardization and interchangeability), nominal shaft and bore diameters (descriptive geometry and engineering graphics) [9,10].

C. SCH 18 (materials science), 0 ... 5 (metrology, standardization and interchangeability), outer and inner diameter of the bearing (descriptive geometry and engineering graphics) [11].

2. Keys by design are ..., standardized with a tolerance field ... and manufactured on ... .. machines.

A. Prismatic, segment, wedge (machine parts), h9 (metrology, standardization and interchangeability), on milling machines (mechanical engineering technology).

B. Round, prismatic (machine parts), H9 (metrology, standardization and interchangeability), on drilling machines (mechanical engineering technology).

C. Rectangular, triangular, guide (machine parts), A9 (metrology, standardization and interchangeability), on modular machines (mechanical engineering technology).

DISCUSSION

Integrative testing is preceded by the organization of integrative learning. Unfortunately, the current form of the lesson, combined with the excessive fragmentation of academic disciplines, together with the tradition of teaching certain disciplines, will hamper the introduction of an integrative approach into the processes of training and control of preparedness for a long time.

The advantage of integrative tests over heterogeneous ones lies in the greater informative content of each task and in a smaller number of tasks themselves. The need to create integrative tests increases with the increase in the level of education and the number of studied disciplines. Therefore, attempts to create such tests are noted mainly in higher education. Integrative tests are especially useful for increasing the objectivity and effectiveness of the final state certification of students.

The methodology for creating integrative tests is similar to the methodology for creating traditional tests, with the exception of the work on determining the content of the

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tasks. For the selection of the content of integrative tests, the use of expert methods is mandatory. This is due to the fact that only experts can determine the adequacy of the content of the tasks to the objectives of the test [13].

First of all, it will be important for the experts themselves to determine the goals of education and study of certain educational programs, and then agree among themselves on fundamental issues, leaving only variations in understanding the degree of importance of individual elements in the general structure of preparedness for examination.

CONSLUSION

The developed methodology for the preparation of integrated tests using interdisciplinary connections of general professional disciplines was applied to establish interdisciplinary connections between disciplines, general technical, general professional and special cycles, as well as control of students' knowledge in the preparation of bachelors at a university and it was proved that the listed disciplines determine the level of professional training of specialists in the field mechanical engineering.

Experiments carried out with the use of integration methods, which with the help of interdisciplinary connections in the study of general professional disciplines on the example of the course "Metrology, standardization and interchangeability" in the direction of undergraduate education in mechanical engineering show that student performance increased by 18 – 20% than when using the traditional method of knowledge control. Thus, the use of this method of integrating the control of students' knowledge contributes to the optimization of the educational process, using modern pedagogical and information technologies, and also activates the creative abilities of students.

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