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ORGANIZATION OF THE UNIVERSITY EDUCATIONAL PROCESS: DEVELOPING A METHOD FOR SYSTEMATIC MONITORING OF STUDENTS' MASTERY OF EDUCATIONAL MATERIAL

ORGANIZACIÓN DEL PROCESO EDUCATIVO UNIVERSITARIO: DESARROLLO DE UN MÉTODO PARA EL SEGUIMIENTO SISTEMÁTICO DEL DOMINIO DEL MATERIAL EDUCATIVO POR PARTE DE LOS ESTUDIANTES

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ABSTRACT

The goal of the study is to develop a method for systematic control of students' mastery of the material in higher education disciplines that include academic load in the form of lectures, seminars, and practical and laboratory work. The proposed method provides a prompt objective assessment of the student's knowledge of the current and previously covered topics in class. The authors specify the question forms, answer masks, and grading methods recommended for use. The key distinguishing feature of current control with the developed method is the ability of students to discuss answers when taking the test, as well as to use various reference materials in a regulated way. The obtained results provide a basis for adjustments to the goals and objectives of the discipline and modifications of educational trajectories to spend more time on the material not properly learned, for determining the underlying causes, or for studying additional material if the control results are satisfactory.

Keywords:

Education, quality of education, educational program, pedagogical technologies, teaching methods.

RESUMEN

El objetivo del estudio es desarrollar un método para el control sistemático del dominio del material por parte de los estudiantes en disciplinas de educación superior que incluyen carga académica en forma de conferencias, seminarios y trabajos prácticos y de laboratorio. El método propuesto proporciona una evaluación objetiva y rápida del conocimiento del estudiante sobre los temas actuales y tratados previamente en clase. Los autores especifican las formas de las preguntas, las máscaras de respuesta y los métodos de calificación recomendados para su uso. La característica distintiva clave del control actual con el método desarrollado es la capacidad de los estudiantes para discutir las respuestas al realizar la prueba, así como para utilizar diversos materiales de referencia de forma regulada. Los resultados obtenidos brindan una base para ajustes a las metas y objetivos de la disciplina y modificaciones de las trayectorias educativas para dedicar más tiempo al material no aprendido adecuadamente, para determinar las causas subyacentes o para estudiar material adicional si los resultados de control son satisfactorios.

Palabras clave:

Educación, calidad de la educación, programa educativo, tecnologías pedagógicas, métodos de enseñanza.

INTRODUCTION

The principal task of the education system is to raise students' motivation and interest in learning, enhance their intellectual abilities, develop critical and creative thinking, and activate learners' ability to solve unconventional tasks and problems (Rakhimi-Mand, 2013). Researchers in pedagogy assert that the introduction of new teaching methods and technologies into the educational process will increase students' level of education and, therefore, competitiveness (Liu et al., 2020; Logachev et al., 2022ab). Interest in learning reduces when the content of classes is cliched and monotonous and consists of formal components (e.g., writing down definitions, reading information from presentation slides, etc.). Students' active engagement in the educational process must not be limited to finding a special way to explain new material but include students' moderate involvement in information search, discussions, critical thinking, etc. All these conditions have to be defined by the teacher depending on the specific case to efficiently manage the content of classes based on the degree to which students understand the material (Yakhyaeva & Muskhanova, 2022). This purpose is served by various methods of current control (surveys, tests, detailed open-ended answers, etc.). These knowledge control methods require substantial time to not only prepare and check but also to hold them. This raises the need to develop a method for testing students' knowledge that could be used systematically without sacrificing much time for core classes and checked quickly and objectively, as well as provide high student engagement and deliver results reflecting the current level of mastery of the covered topics, allowing making adjustments to the didactic content of upcoming lessons (Belenkova et al., 2022).

The goal of the present study is to develop a method for testing students' knowledge of disciplines in higher education programs.

The theoretical significance of the study consists in the development of a concept for current control of students' knowledge of each topic in the academic course with an indication of the time required for testing, the specifics of the formation of its content, and interpretation of the obtained results.

The practical significance of this research lies in the opportunity to include an objective method of testing students' knowledge in the assessment materials and methodological recommendations for current knowledge control in different educational areas.

METHODOLOGY

The object of the study is training sessions in the disciplines of undergraduate educational programs except for creative and sports directions. Training sessions refer to all types of classes (lectures, seminars, and laboratory work) belonging to classroom load, i.e. students' load in contact with the teacher (excluding independent work).

The methods used in the study can be divided into two groups:

1. Methods employed to distinguish the key specifics of organizing the process, which allow modeling and evaluating changes. The generally accepted method is the method of analysis with a step-by-step clarification of the details of the subject area relevant to the process. Researchers of all kinds of processes use the method of analysis to identify all objects and subjects of the process and establish connections between them and factors affecting changes in the states of the process (Logachev et al., 2020ab; Logachev et al., 2022ab). Based on the results of analysis and the method of synthesis, formal models are created, which principally describe qualitative or quantitative characteristics of the subject area necessary for the development of different methodologies.

2. Methods implementing pedagogical technologies in the educational process, which were the basis for developing the concept of the current knowledge control method. For this purpose, we use didactic principles that provide feedback in the learning process to obtain information about the success of the educational program and the efficiency of the training process. To this end, a synthesis of the following generally accepted methods was used:

- the method of frontal control, which involves all students in the group completing the same task (in this, the external type of control was used, i.e. the teacher controlled the results of students' work) (Lopez-Belmonte et al., 2020);

- the method of written control in the form of a control test, which determines the level of current knowledge within one topic or didactic unit;

- the brainstorming method, allowing a group of students to shortly discuss and formulate answer options for the assignment, followed by the choice of the most optimal or appropriate answer to the question posed (Rassudovskaya et al., 2020);

- the rating method of assessing the mastery of educational material, which allows for ranking students' results relative to each other. This method allows for establishing a uniform grading scale based on objective parameters.

DEVELOPMENT

The above-described methods allowed us to develop a method for assessing the current results of students' mastery of training material. The essence of the method consists in holding mini control tests at each lesson.

We established that the number of mini control tests needs to be proportionate to the number of classes. In this case, the ratio of theoretical, practical, and laboratory classes is irrelevant. The key feature of such tests is that they act as an additional tool for the teacher to determine the degree of mastery of the presented material. For this reason, these tests are not graded and unsatisfactory results must not affect students' access to midterm exams or their results. This method is recommended for forming the rating of students within a group (or the entire year, if there are several groups). This rating can be used as an incentive during midterm exams.

A key feature of such control tests is that they are mini. This means that, compared to regular test work, both the number and nature of tasks and the time to complete them are reduced. It is optimal to have five questions that should be completed within 5-6 minutes.

The content of the questions should be derived from the current content of the class (three questions) and previous topics (two questions). All questions should require a short and unambiguous answer. Drawing an analogy with close-ended test items, these are questions requiring a short answer, judging the correctness of a statement, and setting a sequence. The answer has to be short, around 2-3 words. It is not recommended to use multiple-choice questions. The student needs to formulate their answers themselves. A major feature of these assignments has to be the ability of students to search for answers. This implies that they are allowed to use all materials available to them, including lecture notes, textbooks, handbooks, etc. It is difficult to control students' use of electronic information resources, since students may take notes in digital form. Thus, there is no reason to limit the use of such sources, since in the future the Internet will be available to students for any professional task anyway. In this regard, it is recommended to formulate test tasks so that the answers could not be found online (for example, a term definition, image search, etc.). Such appropriate questions can require answers that are found by combining two facts. Thus, the student will need to find the descriptions of both facts (whatever the source), independently combine them based on a criterion from the question, and then formulate a precise answer.

In addition to reference materials, students are allowed to discuss answers with each other. The purpose of control may seem to be lost, as the student can use all the sources and discuss the answers with others. This is not the case. The questions have no answer options and require analysis of several statements in about a minute. The factor of limited time plays a decisive role: in this short time, the student must find and read the information, discuss it with other students, make a decision for themselves (whether to agree with the others), and formulate an answer. These conditions make it necessary for the student to know the content of their materials (to navigate them well) and critically assess others' judgments. In our research procedure, students were given a little time (5-10 seconds) to check their answers after the last question. Practice shows that when given more time for checking, most students start frantically correcting and rewriting their answers.

Immediately after all the works are collected, the correct answers are voiced with a detailed clarification of why they are accurate. When checking students' works, it is important to not only assess compliance with the expected answer but to evaluate each answer, as it may be partially accurate or use synonymous words.

The weight of each question was set at one point. A question can be graded with a part of a point if partially correct. In this respect, it is advisable to establish the approach to situations when answers do not correspond to the answer mask or contain spelling or syntax errors and inform students of this policy in the first lesson. In this study, we applied different methods of grading: hard – zero points if there were errors in the answer, and soft – the score was fractioned by the degree of accuracy of the answer. In both cases, penalty points need to be used, because students have to develop not only professional but also general cultural competencies.

Based on the results of all control tests, it is advised to calculate the mean score to perform student ranking. This recommendation relates to the fact that students do not recognize the significance of each test when the scores are simply summed. In the latter case, a single low score does not lower the total in a major way, which may create a false impression that there is no problem with knowledge of the material.

The results obtained in the study closely align with the findings of other researchers. The method developed by our team of authors includes the following components:

1. Strengthening of cross-cultural communication, because the method allows for brainstorming on any assignment. In this case, students independently split into teams based on different criteria (level of preparedness, level of knowledge, etc.), choosing the most

productive one. As noted by Selimkhanov (2021), the methods used by faculty should encourage students to interact productively. This is how the social experience of graduates is shaped. This approach is not the only one and is comparable with the results obtained by other researchers in the field of professional interaction (Rassudovskaya et al., 2020; Murphy et al., 2020).

2. Student rating. Psychological and pedagogical research indicates that the rating system balances subjectivity on the part of teachers, lack of control tools adequate to the competency-based approach to learning, lack of unified scales and criteria for assessing results, etc. (Iatsenko, 2009; Kudentsova, 2011). Indeed, the resulting method systematizes the entire educational material of the discipline and allows assessing the current level of knowledge, as well as its residual level, applying a unified assessment scale. In this case, it is possible to compare quantitative and qualitative characteristics of students' knowledge based on integral indicators (Lopez-Belmonte et al., 2020; Logachev et al., 2020ab).

3. Realization of the practice-oriented approach. The absence of questions on the knowledge of definitions allows for efficient examination of the methods of carrying out professional operations within the framework of job competencies, for example, as a task to present modified algorithms of actions to find the error or determine the possibility of applying the operation in a particular situation (Tkacheva, 2012; Logachev et al., 2020ab). This is especially important when the decision must be made promptly, for example, in the event of an abnormal situation. The developed method can simulate such a situation in the short time available for the corresponding task.

4. Organization of efficient information search. Scholars point to the ability to find the required information in the shortest possible time as an important competency of a future specialist (Arsenijević et al., 2020; Logachev et al., 2021). The proposed method forms in students the ability to identify keywords in the text of the task and systematize their materials so that the information could be quickly found on them.

CONCLUSIONS

The critical requirement of the activity approach in student training is the development of logical thinking skills in making decisions related to professional practice. This requirement entails the need to improve quality control systems for both teaching material and assessment of the level of its mastery when developing educational programs. Proceeding from the results of testing, decisions have to be made either to change approaches to the choice of teaching methods or to improve the content of sections

of the discipline. Apart from mastering didactic units during the learning process, the student must develop personal qualities that allow them, for example, to carry out business communication, organize their work to increase its productivity, or quickly and accurately search for reference materials. The concept of a current control method developed in this study provides for the implementation of such approaches in teaching.

As a result of the study, a method is developed that allows organizing a systematic control of students' knowledge of any topic of the academic discipline. These results are important for the teacher as a basis for managing the training process (for instance, not starting a new topic before the previous theoretical knowledge is clear and accurately applied in practice). In addition, poor results inform the student of their insufficient knowledge of particular sections of the course. The use of such assessment reduces the subjectivity of grading because upon completing a task, the student gets the correct answer with explanations or references to the relevant didactic units of the section. This eliminates the possibility of different viewpoints on the same topic. Assessment of the correctness of the answer is transparent.

The proposed method of knowledge control can be used by teachers in various educational programs both in higher and secondary vocational education. In addition, the method does not preclude the use of traditional methods of knowledge control but serves as an additional tool for the teacher that does not take up much time from the training session. The results obtained are valid, as the study used generally accepted research methods supported by the theoretical and practical findings of other scientists in the relevant subject area. Importantly, the developed concept of current control organization does not contradict the provisions of modern pedagogy and can be used in the educational process.

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