

**TEACHING PRINCIPLES FOR THE DEVELOPMENT OF THE QUALITY MONITORING SYSTEM FOR PROSPECTIVE MASTERS IN STOMATOLOGY IN THE EDUCATIONAL ENVIRONMENT OF THE UNIVERSITY**

***PRINCÍPIOS DIDÁTICOS DE DESENVOLVIMENTO DO SISTEMA DE MONITORAMENTO DA QUALIDADE DO ENSINO DE MESTRANDOS EM ESTOMATOLOGIA NO AMBIENTE UNIVERSITÁRIO***

***PRINCIPIOS DIDÁCTICOS PARA EL DESARROLLO DEL SISTEMA DE MONITOREO DE CALIDAD PARA FUTUROS MAESTROS EN ESTOMATOLOGÍA EN EL ENTORNO EDUCATIVO UNIVERSITARIO***

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**ABSTRACT:** The need for qualitative assessment of prospective Masters in Stomatology professional competence requires continuous monitoring of the educational process to find ways to improve it in all components. The study empirically tests the didactic principles of monitoring the quality of education of prospective Masters in Stomatology in the university's educational environment. The research was conducted at Poltava State Medical University in five stages during 2019-2022. The study utilizes the methods of theoretical, empirical questionnaires, surveys, pedagogical testing, and observation. Given the results, the didactic principles (the scientific principle, accessibility, systematization and coherence, visibility, control and correction of knowledge, strength of knowledge, connection between theory and practice, optimization of learning) in the general didactic context are designed to regulate the learning process, control over it and evaluation of program learning results, and act as a methodological basis for monitoring the quality of education of prospective Masters in Stomatology in a medical institution of higher education.

**KEYWORDS:** Didactic principles. Masters. Monitoring. Educational environment. Education quality.

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**RESUMO:** A necessidade de avaliação qualitativa da competência profissional dos mestrandos em Estomatologia exige um acompanhamento contínuo do processo educativo para encontrar formas de o melhorar em todas as componentes. O estudo testa empiricamente os princípios didáticos de monitoramento da qualidade do ensino de mestrandos em Estomatologia no ambiente universitário. A pesquisa foi conduzida na Universidade Médica do Estado de Poltava em cinco etapas durante 2019-2022. O estudo utiliza os métodos teóricos, questionários empíricos, pesquisas, testes pedagógicos e observação. Diante dos resultados, os princípios didáticos (o princípio científico, a acessibilidade, a sistematização e a coerência, a visibilidade, o controle e a correção do conhecimento, a força do conhecimento, a conexão entre teoria e prática, otimização do aprendizado) no contexto didático geral são projetados para regular o processo de aprendizagem, controle sobre este e avaliação dos resultados de aprendizagem do programa, além de servir de base metodológica para o monitoramento da qualidade do ensino de mestrandos em Estomatologia em uma instituição médica de ensino superior.

**PALAVRAS-CHAVE:** Princípios didáticos. Mestrado. Monitoria. Ambiente educacional. Qualidade da educação.

**RESUMEN:** La necesidad de una evaluación 'cualitativa de la competencia profesional de los futuros Magísteres en Estomatología requiere un seguimiento continuo del proceso educativo para encontrar formas de mejorarlo en todos los componentes. El estudio prueba empíricamente los principios didácticos del seguimiento de la calidad de la formación de los futuros Magísteres en Estomatología en el ámbito educativo universitario. La investigación se llevó a cabo en la Universidad Médica Estatal de Poltava en cinco etapas durante 2019-2022. El estudio utiliza métodos teóricos, cuestionarios empíricos, encuestas, pruebas pedagógicas y observación. Dados los resultados, los principios didácticos (principio científico, accesibilidad, sistematización y coherencia, visibilidad, control y corrección del conocimiento, solidez del conocimiento, conexión entre teoría y práctica, optimización del aprendizaje) en el contexto didáctico general están diseñados para regular la proceso de aprendizaje, control sobre el mismo y evaluación de los resultados del aprendizaje del programa, y actuar como base metodológica para el seguimiento de la calidad de la formación de los futuros Magísteres en Estomatología en una institución médica de educación superior.

**PALABRAS CLAVE:** Principios didácticos. Maestrías. Seguimiento. Ambiente educativo. Calidad educativa.

## Introduction

In the general pedagogical context, the quality of higher medical education is determined not only by the amount of knowledge, abilities, and skills acquired by students of higher education in a medical institution of higher education, but also by the parameters of worldview, civic, personal, competence-professional development, at the same time, the problem of the quality of the educational process considered from the standpoint of the universal and social value of medical education (ARBUSOVA *et al.*, 2020; KONOVALENKO

*et al.*, 2021). It is these factors that actualize the problem of quality management of higher medical education in a higher education institution and monitoring the quality of the educational process, which is an integral component of quality management of the training of students of higher education in medical institutions of higher education, in particular, monitoring the quality of education of prospective Masters in Stomatology (IBRAGIMOVICH, 2020). At the same time, when studying the problems of developing a system for monitoring the quality of education of prospective Masters in Stomatology, it is worth considering that in the conditions of digitalization of society and the system of providing medical services, in particular, the training of dental specialists should be based on a combination of fundamental assimilation of the basics of theoretical professional knowledge with the acquisition of practical skills and skills of applying this knowledge in future professional activities in the conditions of digital transformation of the health care system (SOLDATOV; SOLDATOVA, 2021). We are convinced that the educational process of training a dental specialist (graduates of the second (Master's) level of higher education in the specialty 221 Stomatology, the field of knowledge 22 Health care, educational qualification: Master in Stomatology) should be aimed not only at the training of highly qualified, competitive, competent specialists, able to solve complex tasks and problems in the field of dentistry and health care or learning process, which are characterized by the uncertainty of conditions and requirements, and to perform the professional activities of a dentist, but also for the constant improvement of this process, for the implementation of modern pedagogical technologies, educational concepts, and paradigms, to improve the quality of educational services in medical institutions of higher education (KONONETS *et al.*, 2021; DOROKHOVA, 2021). Therefore, the problem arises of developing a system for monitoring the quality of education of prospective Masters in Stomatology, which includes effective and modern mechanisms for collecting, processing, and disseminating information about the activities of higher education institutions, assessing professional competence (integral competence, a set of general and professional competences) of higher education applicants, which provides continuous monitoring of the educational process, searching for ways of its improvement, forecasting, and development (TUKSHUMSKAYA *et al.*, 2020). It is the search for ways to develop and improve the system of monitoring the quality of education of prospective Masters in Stomatology that we direct to the consideration of didactic principles, which are the basis of the functionality of this system.

Based on analysis of works of scientists-didacts (SPIRINA *et al.*, 2018; ARBUSOVA *et al.*, 2020; LUZAN *et al.*, 2021), it is clear that didactic principles are the leading of ideas, the main requirements to activity in the educational process, guidelines of behavior, initial

provisions, pedagogical and psychologically grounded and proven practice. The study of the scientific order of scientists testifies to the powerful multi-year experience of the process of teaching, which is based on the group of didactic principles (principles relating to all components of didactic process; principles relating to the activity of subjects of teaching and their methods; principles relating to educational and cognitive activity; principle concerning the control and evaluation functions of the didactic process), among which are: scientific; systematization and sequence; activity; and independence; consciousness; point of view; ground; connection of training with practical activity (principle of connection of theory with practice); accessibility; individualization; emotionality of training; optimization of training; control and correction of knowledge (LEBEDYK, 2019). The latter, in our opinion, is a key didactic principle in our research, the core of the system of monitoring the quality of education of prospective Masters in Stomatology.

## Methodology

This present study mainly attempts to test experimentally the didactic principles of the development of the quality of monitoring the quality of education of prospective Masters in Stomatology in the educational environment of the university.

The pedagogical experiment lasted during 2019–2022 (the ascertaining one from 2019 till 2020, the formative one – 2021–2022). The research was conducted in Poltava State Medical University in five stages during 2019–2022. For conducting a pedagogical formative experiment on the introduction of didactic principles of the development of monitoring the quality of education of prospective Masters in Stomatology in the educational environment of the university experimental and control groups were made, which did not differ from the majority of students of the medical faculty № 1, the medical faculty № 2 and the international faculty in terms of general characteristics and performance indicators. A representative sample of students of the stomatological faculty, studying in the educational-professional program «Stomatology», was determined, where 1947 students (900 men and 1047 women) were involved into the ascertaining stage of the experiment.

The program and methods of research and experimental work to assess the effectiveness of didactic principles of the development of the quality of monitoring the quality of education of prospective Masters in Stomatology in the educational environment of the university were conducted in stages with the definition of tasks and scientific and pedagogical methods of research. The pedagogical experiment covered the ascertaining and forming stages. The

ascertaining stage provided carrying out of diagnostic research of efficiency of didactic principles of the development of the quality of monitoring the quality of education of prospective Masters in Stomatology in the university. The formative experiment provided for experimental verification of didactic principles of the development of the quality of monitoring the quality of education of prospective Masters in Stomatology in the Poltava State Medical University.

The below research approaches are utilized to solve the set tasks and achieve the goal:

- *theoretical*: an approach of comparative and conceptual analysis, comparing the current and available theoretical methods to address the current state of the quality of education of future masters of stomatology based on the generalization of philosophical and methodological, educational literature, pedagogical and psychological, innovative experience and generalization several years of teaching experience; approach of structural-system analysis and modeling;

- *empirical*: approaches of gathering data (surveys, questionnaires, pedagogical testing and monitoring of educational activities of prospective stomatology masters), analysis of interviews, learning outcomes, methods of expert assessment, self-assessment, generalization of independent characteristics;

- *experimental*: formative, ascertaining, and control stages of pedagogical experiment, clarity methods;

- *mathematical statistics approaches*: used to identify the reliability of the difference between the studied indicators, the adequate processing of the outcomes, reflecting them in graphical and tabular forms, conducting an experimental test of didactic principles of the development of the quality of monitoring the quality of education of prospective Masters in Stomatology in the university; descriptive statistics, the statistical significance determination of variations among groups by the Student's t-test and correlation analysis by the Pearson method.

## Results and Discussion

The need for qualitative assessment of professional competence (integral competence, a set of general and professional competencies) of prospective Masters in Stomatology requires continuous monitoring of the educational process to find ways to improve it in all components. Since control-regulatory and evaluation-resultative components are important components of the educational process, we will focus research attention on didactic principles for their

organization. Basic analysis of scientific works (IBRAGIMOVICH, 2020; SOBOLEVA; KARAVAEV, 2020; KONONETS *et al.*, 2021) gives grounds to interpret in our research didactic principles in coordination of development of system of monitoring of quality of education of prospective Masters in Stomatology as a set of fundamental requirements that must be guided by the development of control-regulatory and evaluation-resultative measures that will contribute to the formation and diagnosis of the professional competence of students of higher medical education in institutions of higher education, as well as solving the main tasks of the learning process.

Thus, these principles in the general didactic context are intended to regulate the learning process, control it and evaluate program learning outcomes, as well as act as a methodological basis for creating a system for monitoring the quality of education of future masters of dentistry in a medical institution of higher education. Such principles include the scientific principle, the principle of accessibility, systematization and coherence, transparency, control and correction of knowledge, the strength of knowledge, connection of theory and practice, and optimization of training.

The scientific principle in the process of creating a system of monitoring the quality of education of future masters of dentistry in a medical institution of higher education requires a deep study of the scientific foundations of monitoring in the field of higher education, in particular, medical; retrospective analysis of technologies for monitoring the quality of education, content, forms and methods of monitoring the quality of the organization of educational and methodological work in a higher education institution; objective disclosure of scientific facts, concepts in the field of pedagogical monitoring as a systematic diagnosis of the quality of higher medical education; determination of scientific approaches to the development of a system for monitoring the quality of education of prospective Masters in Stomatology; determination of scientific approaches to the development of criteria for evaluating the program results of Master's studies in Stomatology in a medical institution of higher education; determination of scientific approaches to the development of a system of control measures for evaluating the educational activity of Masters in Stomatology, current and final control of knowledge (semester control and state certification). Scientific approaches to the evaluation of the quality of education of prospective Masters in Stomatology in a medical institution of higher education should be reflected during a single state qualification exam, the components of which are the integrated test exam «KROK», English Professional Orientation Exam, Objective Structured Practice (Clinical) Exam. Education quality assurance departments in medical institutions of higher education should demonstrate the prospects for the development of

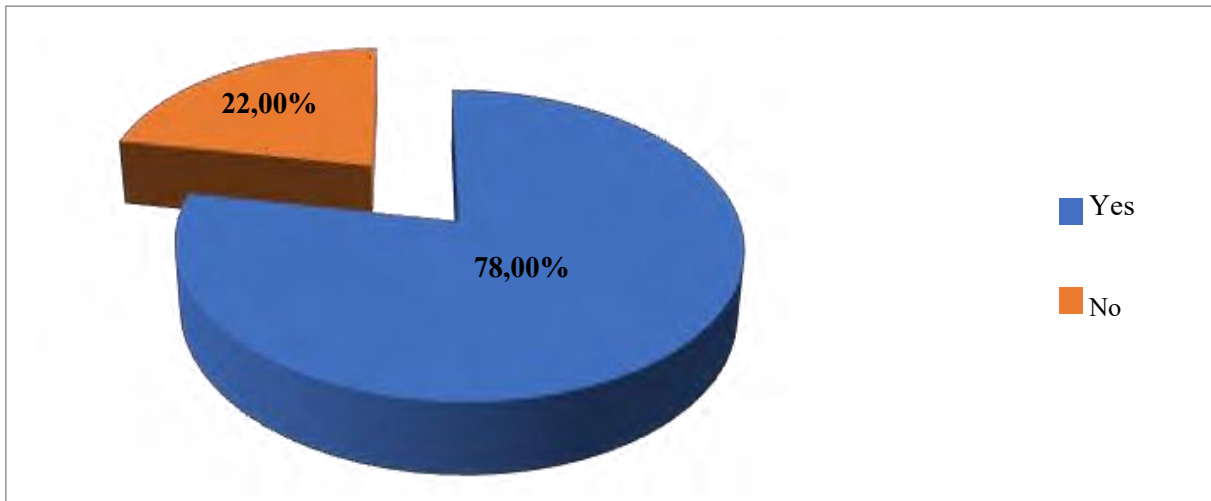
monitoring technologies in the conditions of digital transformations in education, the health care system, and the state; use modern scientific terminology; to acquaint and arm its employees with methods of monitoring and evaluating the quality of education using modern digital technologies; to make corrections to the knowledge obtained by Masters in Stomatology independently; to connect knowledge with life, to reveal the role of medical science for the practice of a dentist of the 21st century; teach students to apply knowledge in practice, reveal internal connections and relationships, etc.

Mechanisms of implementation of the principle: scientific debates and round tables for employees of education quality assurance departments, for scientific and pedagogical personnel of a medical institution of higher education; scientific conferences on the theoretical and practical principles of monitoring the quality of higher medical education (tentative topics «Testing the professional competence of dental specialists», «KROK system: experience and prospects», «Establishment of the pedagogical monitoring system in higher medical education: social, humanitarian and professional aspects», «Educational problems of monitoring development», «Modern problems of diagnosing the professional competence of future dentists», «Modern forms and methods of monitoring», «ICT in modeling the monitoring system», «Digital tools of pedagogical monitoring in higher medical education», etc.); actualization of the scientific activity of employees of departments for ensuring the quality of education, etc.

The principle of accessibility in the process of creating a system for monitoring the quality of education of future Masters of Dentistry in a medical institution of higher education is closely related to the scientific principle and its requirements should not contradict the scientific requirements. This principle assumes that the entire set of knowledge about pedagogical monitoring, monitoring in the field of higher medical education, in particular, dental, technology for monitoring the quality of education, content, forms, and methods of monitoring the quality of the organization of educational and methodological work in a higher education institution, digital tools for pedagogical monitoring in higher medical education, all their variety, and their depth was clear to all monitoring participants (teachers, students, employees of the education quality department, stakeholders etc.). Therefore, it is quite obvious that the principle of accessibility requires that the scientific concepts of the development of monitoring the quality of higher medical education, all the variety and depth of provisions, and implementation measures should be clear to all participants of the monitoring in accordance with their level of professional competence, and therefore should be set out in educational and methodological materials in an understandable and accessible form. We understand the

principle of accessibility in the sense that the monitoring process must be organized in such a way that the content, methods, forms, and technologies of monitoring the results of training correspond to the level of preparation of students for tests and exams (Fig. 1).

**Figure 1** - Availability of educational information to students of higher education regarding goals, content, expected learning outcomes, procedure, and evaluation criteria



Source: Devised by the authors

On the other hand, there is another context of the principle of accessibility in the process of creating a system for monitoring the quality of education of prospective Masters in Stomatology in a medical institution of higher education – the means of monitoring the program results of study should be available to students at any time: computer testing, computer simulations, virtual and augmented reality, operational consultations with the teacher online and offline, web questionnaires for monitoring the quality of the educational process, publication of monitoring procedures on the website of the higher education institution etc. In this, we see implementation mechanisms of this principle.

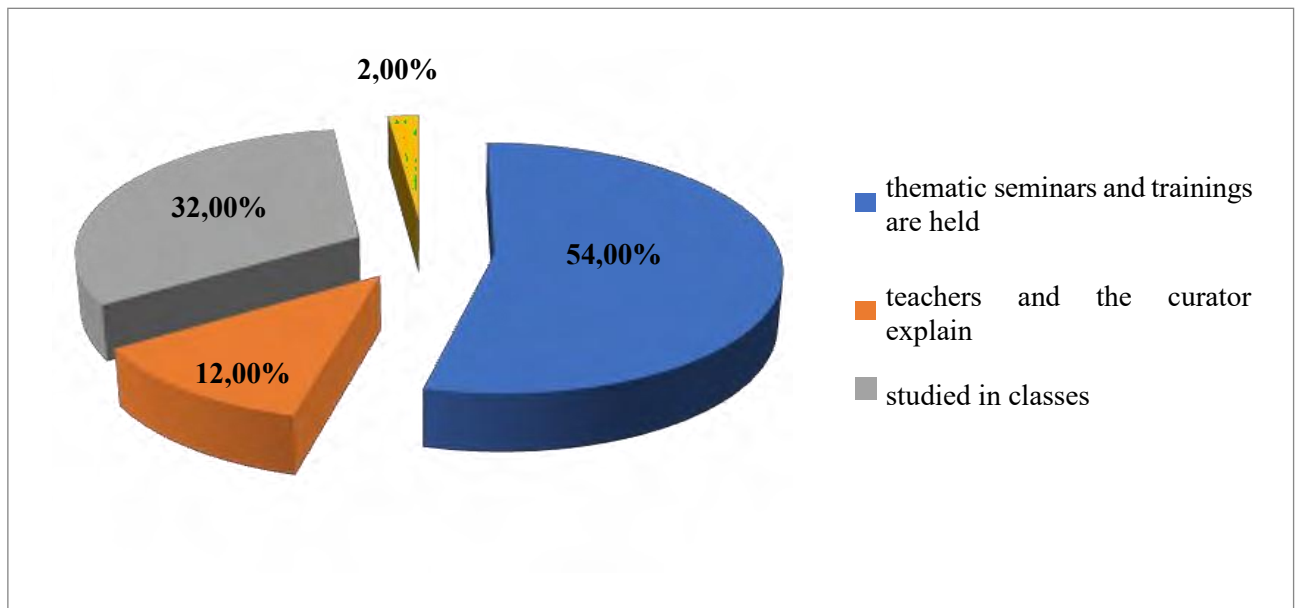
The principle of systematization and coherence in the process of creating a system for monitoring the quality of education of prospective Masters in Stomatology in a medical institution of higher education involves: updating previously accumulated material on the diagnosis of professional competence of prospective Masters in Stomatology; monitoring the dynamics of the formation of various competencies (general and special), defined by the educational program, which are formed during the study of disciplines (for example, «Propaedeutics of Internal Medicine», «Hygiene and Ecology», «Propaedeutics of Therapeutic Stomatology», «Propaedeutics of Orthopedic Stomatology», «Propaedeutics of Children’s Therapeutic Stomatology», «Pharmacology», «Social Medicine, Public Health and the Basics



of Evidence-Based Medicine», «Prevention of Dental Diseases», «Therapeutic Stomatology», «Surgical Stomatology», «Orthopedic Stomatology», «Orthodontics», «Children's Therapeutic Stomatology», «Children's Surgical Stomatology», «Emergency and Urgent Medical Care», «General Medical Training», «Otorhinolaryngology» etc.).

Also, this principle determines the systematic acquisition by employees of departments of quality assurance of education of knowledge in the arena of monitoring technologies, and by scientific and pedagogical workers – knowledge in the arena of organization of monitoring and evaluation activities to identify the real level of formation of one or another competence in the prospective Masters in Stomatology, ensuring the sequence of stages assimilation of educational material from the disciplines of the educational program, consistency in correcting Master's knowledge etc. We see the implementation mechanisms of this principle as: the need for such an organization of the training process of prospective Masters in Stomatology in order not to violate general approaches to mastering the content of the educational program, logical connections between disciplines, between modules in each discipline, mandatory consideration of interdisciplinary connections (implementation of the integration approach in medical education); the need for purposeful organization of the process of knowledge control and self-control during the professional training of prospective Masters in Stomatology by determining modern methods (tests, control papers, situational clinical tasks, individual consultations before taking the «KROK» exam or a structured practical exam, taking tests and exams, etc.); the need for a purposeful organization of systematic monitoring of the formation of various competencies during the study of educational disciplines of the educational program; the need for systematic upgrading of the qualifications of teachers for the purpose of modernizing the measures of control over programmatic learning results, and employees of the departments of ensuring the quality of education for the purpose of modernizing the measures of monitoring the quality of education in a medical institution of higher education (Fig. 2).

**Figure 2** - Popularization of Academic Integrity among students of higher education in the university's educational environment

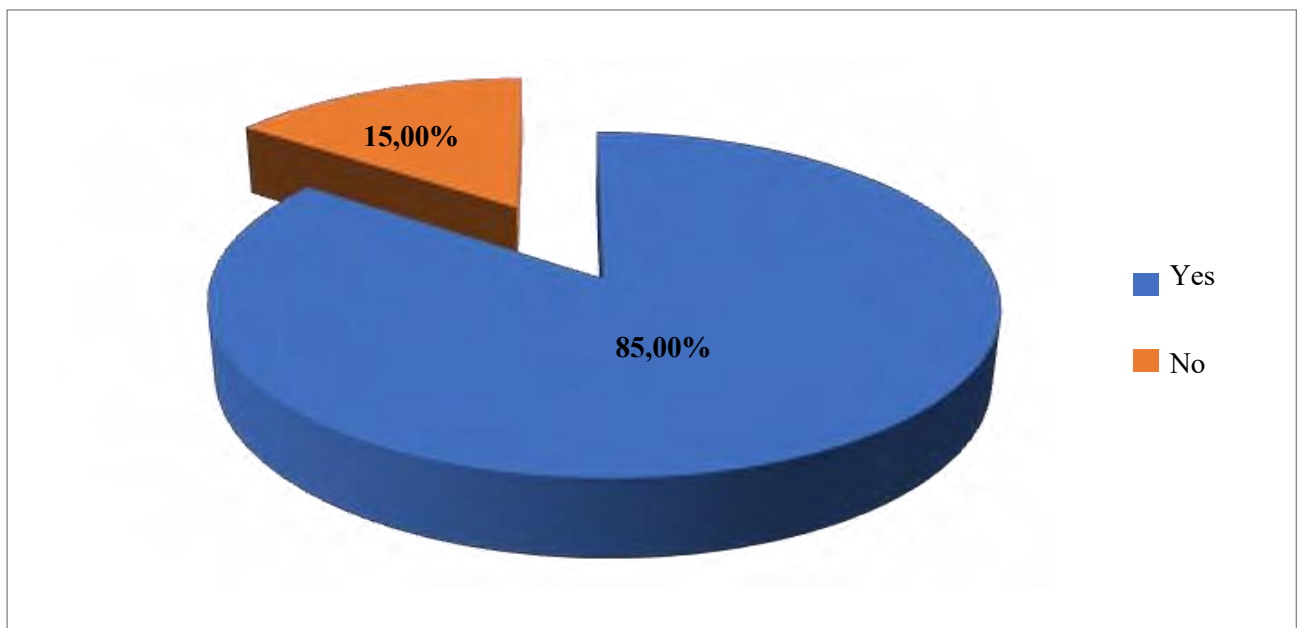


Source: Devised by the authors

The principle of visibility in the process of creating a system for monitoring the quality of education of prospective Masters in Stomatology in a medical institution of higher education involves a harmonious combination of textual educational information with various means of visibility in the process of organizing control measures based on the programmatic results of training and monitoring procedures, which leads to a positive result both in the assimilation of knowledge, as well as in the formation of the ability to self-control, self-analysis of educational activities, self-reflection in the formation of general and special (professional, subject) competencies. Implementation mechanisms of the principle are, in our opinion, various methods of information visualization when creating computer tests or other means of control, stimulation of visual thinking of students (use of schemes, diagrams, mental maps, tag clouds, presentation and animation graphics, media content under time to develop means for self-control); creation of an open monitoring information system using the capabilities of digital technologies as an effective tool for monitoring the quality of higher medical education (digital services for questionnaires Google Forms, WebAnketa, Survio, Padlet virtual board, etc.). It is worth noting that these tools and their content make up the modern informational basis of education quality management in medical institutions of higher education, aimed at obtaining operational and reliable information about the quality of student training in educational programs, the conditions for achieving qualitatively new educational results. Such a monitoring information system based on digital services for questionnaires and feedback, comments, and

suggestions from students, teachers, and stakeholders should become a comprehensive management tool that will allow collecting, storing, process, and disseminating information about the activities of medical institutions of higher education, determine the state of training of higher education applicants education and predict development, as well as evaluate the quality of educational programs (Fig. 3).

**Figure 3 - Adequacy of methodical provision of educational disciplines**

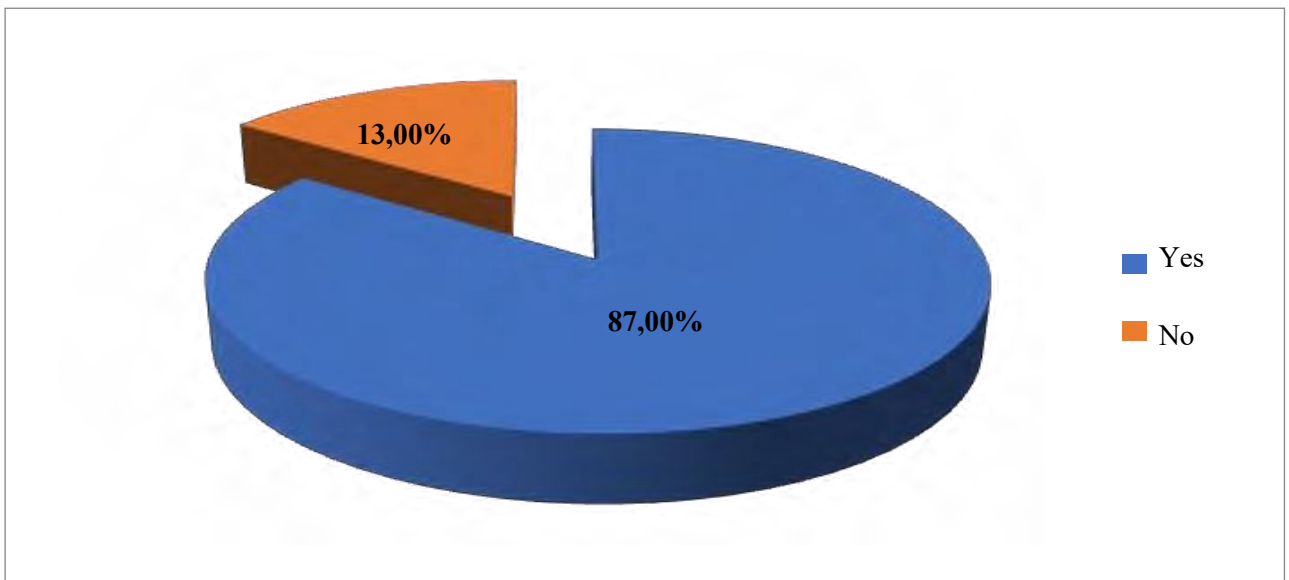


Source: Devised by the authors

The principle of control and correction of knowledge in the process of creating a system for monitoring the quality of education of prospective Masters in Stomatology in a medical institution of higher education involves not only educational and control-regulatory interaction in the «teacher-master's degree» tandem, constant obtaining by the teacher of objective information about the educational achievements of Master's degrees in Stomatology and the implementation of corrective measures based on a comparison of the actual degree of achievement of program learning outcomes, the actual level of development of competencies (general and special) among master's students with the planned, but also the constant interaction of scientific and pedagogical workers with employees of the department of quality assurance of education in a medical institution of higher education through the implementation of monitoring procedures. These procedures of management of the educational process are based on the assessment of the degree of achievement of program learning outcomes for each discipline of the curriculum, as well as the degree of achievement of the appropriate level of formation of various defined competencies. This is a necessary attribute of the quality of the

educational process both from the point of view of teachers, employees of education quality assurance departments, stakeholders, and from the point of view and in the interests of students. Implementation mechanisms of the principle include, first of all, the knowledge control system for Masters in Stomatology (current module control, test control, exams, tests, portfolio of a future stomatologist, narratives, interviews in focus groups, online surveys, and questionnaires, etc.) and the system monitoring procedures (collection of data on learning results for each discipline, statistical processing of results, dynamics of levels of formation of general and special competences, pedagogical quality metrics, monitoring of the quality of teaching and methodical work of teachers, etc.) (Fig. 4).

**Figure 4** - Satisfaction of students of higher education with forms and methods of learning and teaching



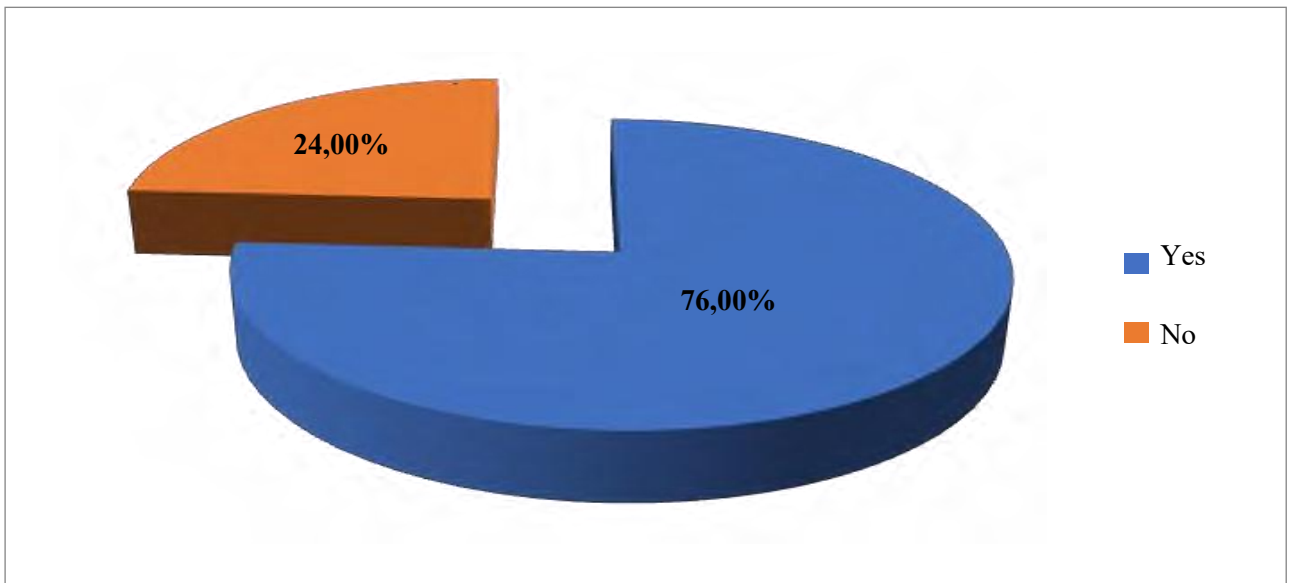
Source: Devised by the authors

The principle of the strength of knowledge in the process of creating a system for monitoring the quality of education in a medical institution of higher education is closely interconnected with the previous one, the principle of control and correction of knowledge. It is quite logical that it envisages obtaining such thorough knowledge by dental graduate students, which would be reproduced consistently without much effort and which they would easily and skillfully use when solving various practical problems, demonstrating practical (clinical) components of professional competence at a real object or on the model. Of course, the control of this knowledge takes place with the help of an objective structured practical (clinical) exam, which is defined as a mandatory component of the evaluation of program learning outcomes in

educational programs for the preparation of Masters in Stomatology. The system of knowledge and such practical skills is, undoubtedly, the foundation, the basis for carrying out the professional activity of a dentist, as well as the development of the creative activity of prospective stomatologists in the future profession. Therefore, monitoring procedures should be focused on improving the mechanisms and resource provision of evaluation of program learning outcomes in Masters in Stomatology education programs in the context of demonstrating the practical skills and skills of prospective stomatologists to successfully and effectively perform their work.

Implementation mechanisms of the principle: methods of independent work of prospective Masters in Stomatology, virtual and augmented reality as means of learning, control and self-control, practical and creative activity in Simulation centers, Educational-scientific-treatment units, medical institutions of higher education such as «Dental Center», clinical bases, which are equipped with modern material and technical support and dental equipment (universal dental installations, models, simulators, mannequins, phantoms, dummies, etc.). Another aspect of the mechanism of implementation of this principle is the methods of diagnosing the degree of strength of Master's degree students' knowledge and the system of monitoring procedures regarding the practical training of Master's degree students (data collection on the ability to perform practical tasks, statistical processing of results, dynamics of levels of formation of practical abilities, pedagogical quality metrics, monitoring of the quality of educational and methodological support for control and self-control of knowledge, etc.) (Fig. 5).

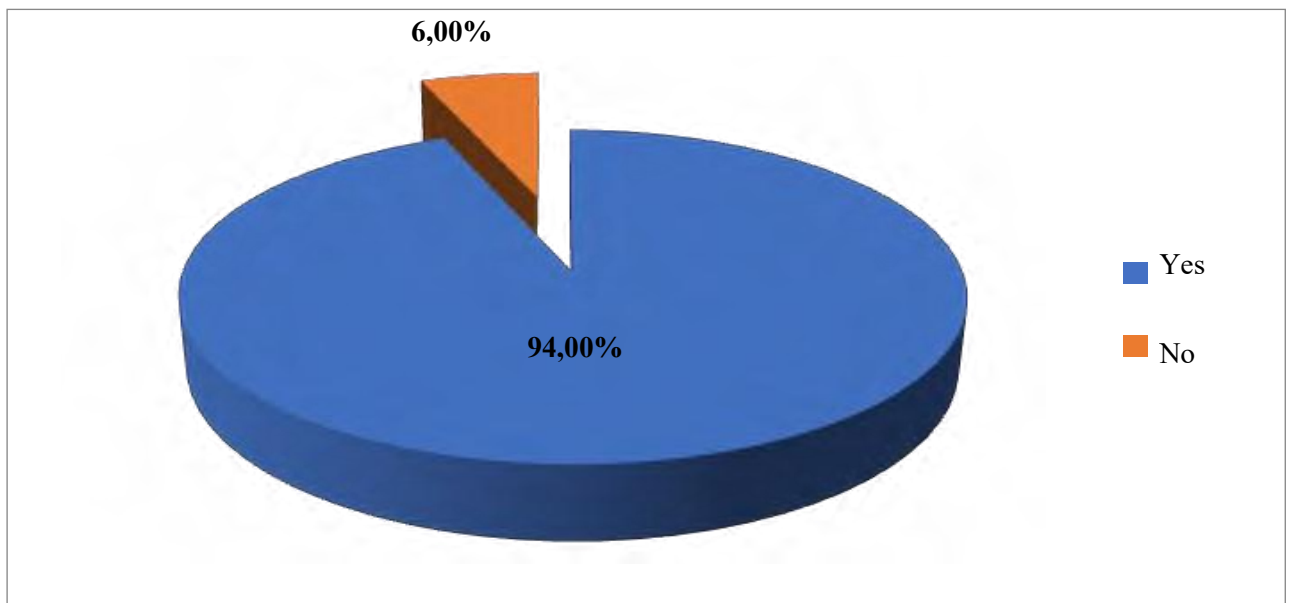
**Figure 5** - Adequacy of the amount of practical training for higher education applicants laid down in the educational and professional program



Source: Devised by the authors

The process of creating a system for monitoring the quality of education of prospective Masters in Stomatology in a medical institution of higher education is aimed at the constant improvement of the training of stomatologists, and therefore at the implementation of the principle of training optimization, which directs us to the search for optimal conditions for the development of the independent cognitive activity of Master's degree students, their creative realization during study under the Master's educational program, for the formation of their general and special competencies (Fig. 6).

**Figure 6 -** Involvement of students of higher education in the process of periodic review of the educational and professional program and other procedures for ensuring its quality



Source: Devised by the authors

At the same time, this principle indicates to us the need to optimize the content, forms, means and methods of training and to monitor its results, to highlight the didactic conditions for monitoring the quality of training of dentists, the optimal combination of traditional means of training, control and self-control with digital, individual and group forms of organization of training for the highest achievement of the specific goal of training, identification and scientific justification of specific principles of creating a system for monitoring the quality of education of Masters' students in Stomatology, building a functional didactic model of monitoring the quality of education of prospective Masters in Stomatology. Mechanisms for implementing the principle are as follows: definition and implementation of specially created didactic conditions for effective monitoring (forms, methods, technologies), development of a functional didactic model for monitoring the quality of education, etc.

## Conclusions

The considered didactic principles in the general didactic context are designed to regulate the learning process, control it and evaluate program learning outcomes, as well as act as a methodological basis for creating a system for monitoring the quality of education of future masters of dentistry at the university.

Summarizing the above, we note that the considered didactic principles (the scientific principle, accessibility, systematization and coherence, visibility, control and correction of knowledge, strength of knowledge, connection between theory and practice, optimization of learning) in the general didactic context are designed to regulate the learning process, control over it and evaluation of program learning results, as well as act as a methodological basis for the creation of a system for monitoring the quality of education of prospective Masters in Stomatology in a medical institution of higher education.

Their further successful implementation depends on many factors: the development of didactics, pedagogy, educational management, pedagogical monitoring, the level of digitization of education in general and a specific medical institution of higher education in particular, the organization of departments for ensuring the quality of education in medical institutions of higher education and many other reasons.

However, the problem of monitoring the quality of education of prospective Masters in Stomatology is little studied in the scientific literature in the didactic aspect, which increases the relevance of the researched problem, and makes it necessary to define not only didactic, but also specific principles of monitoring the quality of education of prospective Masters in Stomatology.

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